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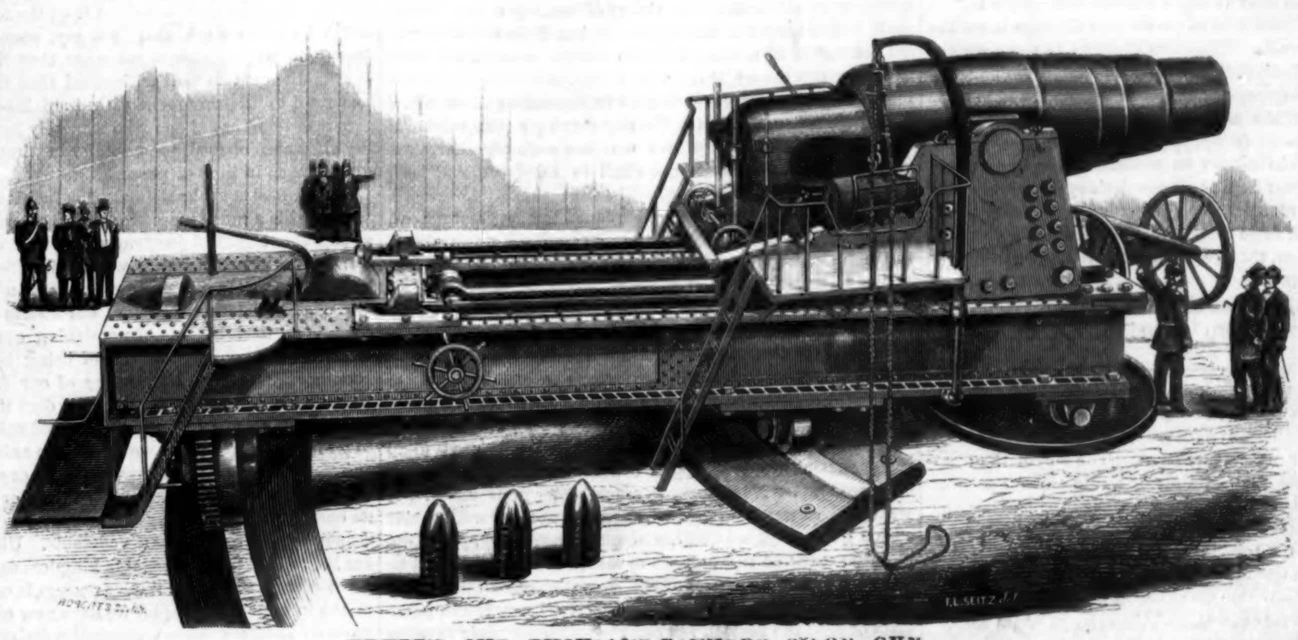
Krupp's 1,000-Pounder Siege Gun.

We give herewith an illustration of the 1,000-pounder Prussian gun from a photograph in our possession. This leviathan breech-loading gun is manufactured in the mammoth establishment of Frederick Krupp, at Essen, in Prussia, and is intended for the arming of coast defenses against the attacks of iron-clad vessels. It consists of an inner tube upon which are shrunk cast-steel rings. The inner tube forms the important part of the gun, and weighs, when finished, twenty tuns. The cast-steel rings are shrunk on the central tube, forming a threefold layer at the powder chamber and at the muzzle portion a twofold layer. The rings are manufactured from massive ingots without welding, and when in a completed state weigh thirty tuns.

The shot or shell is raised by block and fall, and is rolled into the side of the breech through an aperture that is closed by a slide. The system of breech-loading is Krupp's patent arrangement.



KRUPP'S ONE THOUSAND-POUNDER SIEGE GUN.

The total weight of the gun is	50 tuns.
Preponderance	1,500 lbs.
Diameter of bore	14 in.
Total length of gun	17·5 ft.
Number of rifle grooves	40.
Depth of the rifling	0·15 in.
Pitch of the rifling	980 in. and 1014·4 in.
Weight of the solid shot	1,212 lbs.
Weight of the shell	1,080 lbs.

N. B.—The weight of the shell is made up as follows:

The cast-steel shell	843 lbs.
The lead jacket	220 lbs.
Bursting charge	17 lbs.
	1,080 lbs.

The charge of powder weighs from.....110 lbs. to 130 lbs.

For the transportation of this gun a railway car had to be specially constructed. It is made entirely of iron and steel, rests upon twelve wheels, and weighs twenty-four tuns.

When mounted, the gun rests upon a steel carriage weighing fifteen tuns, and the whole is supported upon a turntable weighing twenty-five tuns. The gun carriage slides smoothly upon the turntable to the check at the back stays at each discharge of the piece. Such is the construction of the mechanism necessary for working the gun that one or two men can quickly and easily elevate, depress, or turn it, to follow and cover a passing iron-clad with expedition and accuracy. Gun, gun-carriage, and turntable give a total weight of ninety tuns.

It is supposed that a single shot from this gun would burst in the side of any iron-clad now afloat, while a few shells thrown from it would make terrible havoc in a large city. Some of the daily papers which have announced that Prussia is without suitable siege guns make a great mistake. No nation is better provided. Herr Krupp's establishment is fully six times larger than the largest works for a like purpose belonging to any government. It covers more than two hundred acres actually under roof, and gives employment to more than twelve thousand men. Last year thousands of tuns of breech-loading cannons of all calibers, from the 1,000-pounders down to 4-pounders, were on hand finished in the works at Essen. It would seem that Prussia is fully prepared for any emergency.

Great Circle "Travel."

It is not known by everybody, says George M. Steele, in *Old and New*, though perhaps most people have been told of it several times, that for all purposes of navigation Puget Sound is nearer the great Asiatic marts than is San Francisco. Even if the vessels going out from the Golden Gate took their course direct for Hong Kong or Shanghai, they would, by reason of the longer degrees of latitude farther south, scarcely have less sailing than by bending round more to the north. But in point of fact the prevailing winds and ocean currents of the Pacific are such that vessels from Asia find their most eligible route bringing them within fifty miles of the entrance to Puget Sound; thus making by the Northern Pacific, when completed, a saving of nearly a thousand miles of ocean navigation. This, added to the diminution of distance in the journey overland, gives us a route from our Eastern cities to the coast of Asia shorter than any other by about fifteen hundred miles. When this road shall be in successful operation the time required to reach the Pacific coast by means of it from New York city will not exceed about four days, allowing an average rate of movement of thirty miles an hour. Thence to Shanghai, in China, the voyage will occupy eighteen to nineteen days, at the mean rate of twelve miles an hour; making twenty-two to twenty-three days in all from New York—a less time than is now occupied in making the voyage by the way of the Isthmus to San Francisco.

SHORTT'S SELF-CENTERING SLEEVE COUPLING.

The shaft coupling which forms the subject of the present article claims to offer advantages over any other couplings which have preceded it. Whether so broad a claim as this is justified by its merits, we leave our mechanical readers to judge, but we think they will agree with us that in simplicity, strength, accurate adjustment, and compliance with all the requirements of a first-class coupling, it is entitled to rank very far in advance of many devices of this kind.

The advantages claimed are, that it has neither bolts, keys, nor any other objectionable fastening to destroy belts, or endanger the lives of workmen; its construction is such that it can be put up or taken down in less than one minute; its property of self-compression is positive in direct strain or backlash. It is claimed with a coupling of this pattern, weighing $10\frac{1}{2}$ pounds, a one inch and a half wrought-iron shaft, of the best manufacture, may be twisted into a broken mass of fibers, similar in appearance to the untwisted strand of a wire cable; and, after exposure to such immense strain, this coupling can be removed as easily as when first put on, and will be found as perfect, in every respect.

It is also self-centering, bringing the ends of the shafts and the pulley coupling to a common center, when the wedging screws are turned down as will be seen upon perusal of the description and inspection of the accompanying engraving.

A is a solid ring or drum of metal bored eccentrically, so that when concentric pieces of metal, B, which are thinner at one edge than at the other, are placed therein and adjusted, as shown at C, they exactly connect the eccentricity of the hole in A. The ends of the shafts to be coupled are provided with pins inserted, as shown at D. These pins, when the shafts are coupled, rest in segments of holes, E, in the concentrics, B, made to fit the pins. These pins serve as guides to the adjustment of the concentrics, which are placed over the ends of the sections of shafting, so as to bring the pins into the recesses, E. The ring or drum, A, is then slipped over all and turned so as to bring the screws, F, over the conical-shaped recesses, G. These screws have conical points which, when they are screwed down into the recesses, G, force the recessed edges of the concentrics, B, asunder, so that the latter act as wedges to grip and compress the ends of the sections in a very powerful manner. The screw holes are countersunk so as to bring the heads of the screws below the surface, when they are screwed home, and the heads of the screws have formed in them square recesses, to receive a suitable key or wrench for turning them.

The outside of the concentrics have formed therein grooves, as shown, to hold tallow or grease, to prevent their rusting fast.

Patented, through the Scientific American Patent Agency, Sept. 28, 1869, by E. G. Shortt. For further information address Grant Coupling Co., Carthage, N. Y., or Fuller, Dana & Fitz, 110 North street, Boston, Mass.

A Chicago Perpetual Motion.

A recent number of the Chicago *Times* contains a description, three columns long, of a perpetual motion machine which is said to be now, and for the past seven months has been running in that enterprising city. A Mr. Wickham, Jr., is the inventor of this marvel of science, and the *Times*, which is otherwise very eulogistic of him and his discovery, speaks of him personally as a "*petite*, long-haired young man, who is a trifle shaky in general knowledge, but is as sound as the pyramids in the matter of inventive faculty."

The machine is described as mounted on a marble slab. It consists of a hollow walking beam containing balls filled with mercury.

"The rocking lever or beam of Mr. Wickham's device looks quite like the walking beam of an ordinary steamer. The latter, however, are always shaped after the form of an elongated diamond, while the upper arm of this new lever is quite straight, the lever being bent at sharp angles three or four times. The balls which are placed inside are only partially filled with mercury. This mineral has the peculiar quality of losing its centre of gravity quicker even than water, and, like water, is ever seeking its own level.

"The balls, once set in motion, roll down the interior of the hollow beam in a vain search after a permanent level, for no sooner do they reach the lower end than the mercury in the spokes of the main wheel overcomes their weight, the beam is forced up, and the balls are again impelled in their onward rush, only to be caught by the valve that is forced

open from without, and pushed into the upper arm of the beam or lever, ready to be hustled along upon their never-ending route.

"A delicately adjusted weight and an ingeniously worked brake are attached to the machine, and serve to regulate its nicety of motion and speed, but it is in the hollow spokes and beams, and the untiring balls of quicksilver that the mysterious power lies."

"Of course," says the *Times*, "there are shrewd and scientific people without number who, from even the meager description afforded, will be enabled to sit down at once and by the most conclusive of reasoning show that the device is a failure, and that it cannot work. But they will have to concede one point, and that is, that it *does* work.

"For seven long months has that little beam moved steadily up and down, and the main wheel has ground out its fifty regular revolutions a minute, and the minor cogs have been driven faster still, and the tiny brake has controlled the motions of the whole, the diminutive "governor" regulating all.

"The most astute logic under heaven cannot prove that two and two are not four, and all the reasoning upon the face of the earth cannot do away with the fact that Mr. Wickham's invention has thus far done what is claimed for it."

No one has ever been able to prove that Chicago is *not* the center of the universe. Therefore Chicago *is* the center of the universe, and further discussion of the subject is unnecessary. This is a very popular style of reasoning, and is invariably adopted by the advocates of perpetual motions and other delusions.

To set a machine in motion on a marble slab, and to conceal the motive power from the spectator's eye, is a very easy and common trick of mechanical legerdemain. This is the substance of the Chicago wonder. It is too old a dodge to pay as an exhibition, though perhaps a few simple-minded persons will be duped.

BRONZE VS. STEEL AND IRON FOR FIELD ARTILLERY.

Were no portions of our daily newspapers preserved save the correspondence columns, they in themselves would furnish no contemptible data to a future historian from which to compile the records of a by-gone age. The fact of the existing war has set every one talking or writing about cannon, breech-loaders, and other devices of science for slaying the largest possible number of men in the shortest possible time. At present there is a tolerably vigorous controversy being carried on through the medium of the *Times* and other newspapers as to the relative merits of the new metal, made by Sir Joseph Whitworth for cannon, and the alloy of brass known as bronze for the same purpose. It is of course well known that for military purposes in India it is necessary to have a class of light field piece that combines as high a destructive force as possible with the least possible dead weight. Naturally the design of such a weapon involves the consideration of the following points: First, the adoption of a metal that shall possess the highest attainable coefficient of tenacity, and secondly the description of rifling that will insure at once the longest range, the highest velocity, and the greatest amount of accuracy of flight for the projectile it sends forth on the errand of destruction. *Ceteris paribus*, the gun that can burn most powder will send its shot the farthest. Two considerations affect this point; the one lies in the tenacity of the metal of the gun itself and also its durability; the other is the question of the supposed necessity that a certain proportion must be observed between the actual dead weight of the gun and that of the charge fired from it. The advocates of the use of bronze bring forward as one argument that there is no use in making a gun of a metal possessing a high coefficient of tenacity if you must make the gun so heavy as to enable it to burn sufficient powder to hurl its projectile with maximum effect.

Another point addressing the attention of the artillerist is that of expense. If two metals present themselves as suitable in an equal degree in all respects except the single one of their behavior in the foundery, clearly that metal which gives the smallest number of wasters is the metal to use. Again, as our great guns as well as our small arms are highly finished scientific weapons and no longer mere overgrown gas mains, it is expedient that they should be as durable as possible. In fact, to sum up the theoretical qualities of perfect cannon metal it should be tough, hard, and unlikely to turn out any wasters in the process of casting. Now it is well known that bronze or any metal of a brassy nature is exceedingly difficult to cast so as to insure success, and this class of metal gives, of all others, the largest number of wasters in the foundery. Such is not the case with steel; certainly it is within the memory of most of our readers when steel could only be cast in small quantities. This is altered now, and owing to the large share of attention bestowed on its manufacture steel has become one of the easiest dealt with of metals so long as the necessary conditions are attended to. There can be no question, whatever advocates of bronze may advance to the contrary, that steel is the metal to employ in the formation of cannon, because it contains in a higher degree than bronze the qualities we have already enumerated for the purpose. If we analyze the arguments advanced by the advocates of bronze we find them speedily dwindle to very small proportions. Say these gentlemen: There is no use to have a stronger metal than bronze, because a 9-pounder must be a certain dead weight to give the best results, and as we must have the gun so heavy, it is no use to have a metal of greater tenacity. Arguing in this way they simply ignore the value of a gun more durable because it is of a metal not alone tougher but also harder. They, in order to have their gun a certain weight, adhere to a metal that costs much more both in time and wasters for the sake of this one supposed advantage. Of all weapons a rifled gun needs to be hard in the bore, because, as rifling is the application of a highly scientific principle, it requires that the bore should preserve its peculiar characteristics as long uninjured as possible. A rifled cannon in its way represents features of as great nicety of operation as the link motion of a locomotive. What, then, would be thought of the engineer, who, in order to make his locomotive heavier to get more adhesion, would make all the link motion of bronze instead of steel? or, to put the comparison in another way, who would propose to bush the rods in the links and eccentric rods with bronze instead of with hard steel? Not only has the bore of a gun to withstand the blow of exploding gunpowder, but it has likewise to sustain the rubbing and attrition of the shot moving rapidly along it.

We hear a good deal about the superior trajectory, greater range, etc., of the bronze gun in India, but what peculiar virtue does bronze possess to furnish such advantages? If any of the forms of steel possessed so little value, why was any effort ever made to bush cast-iron guns with it? Yet many attempts of this kind were tried, and the leading causes of failure were not because the theory of bushing a tough outer shell with a hard core was erroneous, but from the mechanical difficulties of getting the two metals to work together. Granting this theory, then, to be sound, is it likely than eminent artillerists are going to give up the matter because of a defect of construction? On the contrary they then reason, if a hard metal and a tough one will not work together, then why not seek for a metal that shall in itself combine both qualities.

Bronze is incapable of being hardened to any great extent, it does not possess remarkable toughness, it is uncertain in the molds. Steel, on the other hand, if dealt with in a proper manner, possesses none of these defects, and we confess we fail to see why it should be put aside on such puerile reasoning as that which says that bronze is strong enough for the required purpose. Might not the question be asked why should it be difficult to desire means to enable a gun of given weight to fire a larger charge of powder than is now asserted to be the most effectual?

So late as six or seven years ago it was considered more than doubtful if a 400-pounder could be ever safely worked on board ship. Now we have much larger guns afloat. If we could accomplish this, why can we not as well devise such a gun-carriage as will, without being heavy, yet so oppose the recoil of the piece as to secure that the gun will be able to give the full effect of the largest charge of powder it can burn without bursting to the shot it delivers? The advocates of bronze overlook the fact that whereas their favorite metal is one of the oldest and in its applicability perhaps the best investigated of all the cannon metals, steel in its various qualities is as yet one of the least so; and if, up to the present, we have got good results from it, what may we not hope from it in the future?—*Mechanics' Magazine.*

THE DISSIPATION OF ENERGY.

BY STEWART in "Nature."

At this point we can imagine some champion of perpetual motion coming forward and proposing conditions of truce. "I acknowledge," he will say, "that perpetual motion, as you have defined it, is quite impossible, for no machine can *create* energy, but yet I do not see from your own stand-point that a machine might not be constructed that would produce work for ever. You tell me, and I believe you, that heat is a species of molecular motion, and hence that the walls of the room in which we now sit are full of a kind of invisible energy, all the particles being in rapid motion." Now, may we not suppose a machine to exist which converts the molecular motion into ordinary work, drawing first of all the heat from the walls, then from the adjacent air; cooling down, in fact, the surrounding universe, and transforming the energy of heat so abstracted into good substantial work? There is no doubt work can be converted into heat—as, for instance, by the blow of a hammer on an anvil—why, therefore, cannot this heat be converted back again into work?

We reply by quoting the laws discovered by Carnot, Clausius, Thomson, and Rankine, who have all, from different points of view, been led to the same conclusion, which, alas! is fatal to all hopes of perpetual motion. We may, they tell us, with the greatest ease convert mechanical work into heat, but we cannot by any means convert all the energy of heat back again into mechanical work. In the steam engine we do what can be done in this way; but it is a very small proportion of the whole energy of heat that is there converted into work, for a large portion is dissipated, and will continue to be dissipated, however perfect our engine may become. Let the greatest care be taken in the construction and working of a steam engine, yet shall we not succeed in converting one fourth of the whole energy of the heat of the coals into mechanical effect.

In fact, the process by which work can be converted into heat is not a completely reversible process, and Sir W. Thomson has worked out the consequences of this fact in his beautiful theory of the dissipation of energy.

As far as human convenience is concerned, the different kinds of energy do not stand on the same footing, for we can make great use of a head of water, or of the wind, or of mechanical motion of any kind, but we can make no use whatever of the energy represented by equally diffused heat. If one body is hotter than another, as the boiler of a steam engine is hotter than its condenser, then we can make use of this difference of temperature to convert some of the heat into work, but if two substances are equally hot, even although their particles contain an enormous amount of molecular energy, they will not yield us a single foot-pound of work.

Energy is thus of different *qualities*, mechanical energy being the best, and universal heat the worst; in fact, this latter description of energy may be likened to the dreary waste heap of the universe, in which the effete forms of energy are suffered to accumulate, and, alas! this desolate waste heap is always continuing to increase. But before attempting to discuss the probable effect of this process of deterioration upon the present system of things, let us look around us and endeavor to estimate the various sources of energy that have been placed at our disposal.

To begin with our own frames, we all of us possess a certain amount of energy in our systems, a certain capacity for doing work. By an effort of his muscles the blacksmith imparts a formidable velocity to the massive hammer which he wields: now, what is consumed in order to produce this? We reply, the tissues of his body are consumed. If he continues working for a long time he will wear out these tissues and nature will call for food and rest: for the former in order to procure the materials out of which new and energetic tissues may be constructed; for the latter, in order to furnish time and leisure for repairing the waste. Ultimately, therefore, the energy of the man is derived from the food which he eats, and if he works much, that is to say, spends a great deal of energy, he will require to eat more than if he hardly works at all. Hence it is well understood that the diet of a man sentenced to imprisonment with hard labor must be more generous than that of one who is merely imprisoned, and that the allowance of food to a soldier in time of war must be greater than in time of peace.

In fact, food is to the animal what fuel is to the engine, only an animal is a much more economical producer of work than an engine. Rumford justly observed that we shall get more work out of a tun of hay if we give it as food to a horse than if we burn it as fuel in an engine. It is in truth the combustion of our food that furnishes our frames with energy, and there is no food capable of nourishing our bodies which, if well dried, is not also capable of being burned in the fire. Having thus traced the energy of our frames to the food which we eat, we next ask whence does this food derive its energy. If we are vegetarians we need not trouble ourselves to go further back, but if we have eaten animal food and have transferred part of the energy of an ox or of a sheep into our own systems, we ask whence has the ox or the sheep derived its energy, and answer undoubtedly, from the food which it consumes, this food being a vegetable. Ultimately, then, we are led to look to the vegetable kingdom as the source of that great energy which our frames possess in common with those of the inferior animals, and we have now only to go back one more step and ask whence vegetables derive the energy which they possess.

In answering this question, let us endeavor to ascertain what really takes place in the leaves of vegetables. A leaf is, in fact, a laboratory in which the active agent is the sun's rays. A certain species of the solar ray enters this laboratory and immediately commences to decompose carbonic acid into its constituents, oxygen and carbon; allowing the oxygen to escape into the air, while the carbon is, in some shape, worked up and assimilated. First of all, then, in this wondrous laboratory of Nature, we have a quantity of carbonic acid drawn in from the air; this is the raw material. Next, we have the source of energy, the active agent; this is light. Thirdly, we have the useful product; that is, the assimilated carbon. Fourthly, we have the product dismissed into the air, and that is oxygen

We thus perceive that the action which takes place in a leaf is the very reverse of that which takes place in an ordinary fire. In a fire, we burn carbon, and make it unite with oxygen in order to form carbonic acid, and in so doing we change the energy of position derived from the separation of two substances having so great an attraction for each other, as oxygen and carbon, into the energy of heat. In a leaf, on the other hand, these two strongly attractive substances are forced asunder, the powerful agent which accomplishes this being the sun's rays, so that it is the energy of these rays which is transformed into the potential energy, or energy of position represented by the chemical separation of this oxygen and carbon. The carbon, or rather the woody fiber into which the carbon enters, is thus a source of potential energy, and when made to combine again with oxygen, either by direct combustion or otherwise, it will in the process give out a deal of energy. When we burn wood in our fires we convert this energy into heat, and when we eat vegetables we assimilate this energy into our systems, where it ultimately produces both heat and work. We are thus enabled to trace the energy of the sun's rays through every step of this most wonderful process, first of all building up vegetable food, in the next place feeding the ox or sheep, and lastly through the shape of the very prosaic but essential joint of beef or mutton entering into and sustaining these frames of ours.

We are not, however, quite done yet with vegetable fiber, for that part of it which does not enter into our frames may, notwithstanding, serve as fuel for our engines, and by this means be converted into useful work. And has not Nature, as if anticipating the wants of our age, provided an almost limitless store of such fuel in the vast deposits of coal, by means of which so large a portion of the useful work of the world is done? In geological ages this coal was the fiber of a species of plant, and it has been stored up as if for the benefit of generations like the present.

But there are other products of the sun's rays besides food and fuel. The miller who makes use of water power or of wind power to grind his corn, the navigator who spreads his sail to catch the breeze, are indebted to our luminary equally with the man who eats meat or who drives an engine. For it

is owing to the sun's rays that water is carried up into the atmosphere to be again precipitated so as to form what is called a head of water, and it is also owing to the sun's heat that winds agitate the air. With the trivial exception of tidal energy all the work done in the world is due to the sun, so that we must look to our luminary as the great source of all our energy.

Intimately linked as we are to the sun, it is natural to ask the question, Will the sun last forever, or will he also die out? There is no apparent reason why the sun should form an exception to the fate of all fires, the only difference being one of size and time. It is larger and hotter, and will last longer than the lamp of an hour, but it is nevertheless a lamp. The principle of degradation would appear to hold throughout, and if we regard not mere matter but useful energy, we are driven to contemplate the death of the universe.

ON THE APPLICATION OF THE HOT BLAST TO BLOW-PIPE PURPOSES.

BY W. SKEY.

The useful and well known effects of the hot blast in the process of iron smelting has induced me to try and extend it profitably to other purposes beyond that which prompted its application in the present instance.

My experiments, as yet, have been confined to testing the effects of substituting a hot blast for a cold one, as hitherto used, for the production of the well known blow-pipe flame; a flame so produced will be expected to have its thermal and illuminating effects augmented, but scarcely, perhaps, to that degree which experiment has demonstrated.

I had better state, at the outset, those particulars which it is necessary to know before relating the results.

The temperature of the blast was, approximately, 500° Fah.; the diameter of the jet, regulating its issue, was one-thirtieth of an inch; the combustible for receiving the blast was stearine.

This flame manifested a very marked superiority over the common blow-pipe flame; substances difficult to fuse in the latter, magnetite, potash-felspar, mica, readily yielded under these circumstances; while thick glass tubes, half an inch in diameter, and hard German glass tubes were tractable to an eminent degree.

Carrying my test experiments still further I found several substances for the fusion of which the oxyhydrogen flame or some equivalent of it in heating power is said to be indispensable, also yielded before the blow-pipe flame thus urged; for instance, platinum, pipe clay, fire clay, agate, opal, flint.

Several samples of each were tried, and always with the same results; it could not well be, therefore, that the fusibility of any of these substances was due to the accidental presence of foreign matter in more than usual quantity.

The platinum was the common platinum foil, also a sample prepared especially for the purpose; the only impurity found in it was iron, as traces, communicated to it in the act of forging; possibly minute quantities of some of the other metals of the platinum series might be present, but they would rather tend to increase its infusibility than otherwise.

Alumina only appeared to vitrify, while, after numerous trials with crystallized quartz, I could not succeed in fusing it to a globule; thin splinters, however, curled round upon themselves, like scolezite, and ultimately assumed a glazed appearance, clearly showing that the melting point was all but reached.

It appears from this that a very small amount of some foreign substances exercises a marked effect upon the fusibility of silica, agate, opal, etc., being only a little less pure than rock crystal, though so readily fusible in this flame.

Regarding the illuminating power of the flame so produced, when allowed to impinge upon a solid substance, such as lime or magnesia, it was not only more intense (as would be expected) but the volume of incandescent matter was largely increased.

Before I proceed to urge the further use of hot air for combustions where high temperatures are necessary I wish to call attention to the fact that the temperature of the flame which I have hitherto worked with can be largely and economically increased by increasing that of the blast; this can easily be done to a three-fold extent.

By substituting heated hydrogen (or burnt coal gas), I have also realized all the effects just instanced with greater rapidity and decision: but the greater diffusiveness of this gas, especially when heated, has prevented me, as yet, carrying the experiments further.

While on the subject of heating both combustibles (at least both the substances which take part in these combustions) I cannot refrain from remarking how easily the temperature of the oxyhydrogen flame even could be increased in this manner; the gases would, of course, have to be heated prior to contact. Upon their more vigorous diffusiveness, when rarefied, I should rely for that solidity of flame so necessary where the communication of very high temperature is desired. The jets regulating the issue of the gases would have to be very fine.

Proceeding now to the next part of this subject, the result of these experiments instanced urge me to recommend for trial the substitution of heated air for oxygen in most of those cases where this gas is now employed in conjunction with hydrogen or other combustible matter as a generator of heat or light; for instance:

1. In the metallurgy of platinum that part of it where the metal has to be fused; also in soldering platinum stills for sulphuric acid works.

2. The fusion of alumina in the manufacture of certain gems.

3. In the production of the Drummond and Bude lights.

The fusion of platinum and alumina is now effected by the oxyhydrogen flame.

Relative to the competency of heated air to perform the part of cold oxygen in the production of such intense lights as these (the Drummond and the Bude), I think this can be demonstrated, almost to a certainty, in the following way:

Thus the flame employed in these investigations has certainly a minimum temperature of 4,596° Fah., since this is the fusing point of platinum, the substance most easily fused of all those that I have tried that are infusible in the common flame; doubtless the temperature is considerably higher, but I will take these figures. On the other hand, the actual temperature of the lime, when the Drummond light is in operation, is (on the authority of Tyndal) only 2,000° C.—3,632° Fah.; hence this flame has an excess of temperature over that of the incandescent lime equal to 964° Fah., a pretty good margin for loss, surely sufficient if properly economized; but as I have already shown this excess of temperature can be largely increased.

In view of the greater controllability of the proposed substitute, the absence of all danger in its use, its not requiring chemical preparation, and its cheapness, compared with oxygen—upon these several points respectively the question should be properly tested.

Besides the substitution of oxygen urged above, the possible fusion of the purer clays and certain silicas, etc., in a ready and economical manner may induce the further utilization of these substances, while in experimental chemistry the facility with which such high temperatures can be attained and kept up may lead, among other things, to some cheaper way of extracting certain metals from their oxides, aluminum, for instance, from alumina or clay.

On reviewing these results it does seem not a little singular that a difference of not more than 500° Fah. in the temperature of the blast should make the difference between the fusibility and infusibility of such substances as platina, agate, fire-clay, etc., in the blow-pipe flame. It will be recollected, however, that the blast has, in this case, not only taken up the heat required to raise a single volume of it to this temperature, but another portion of heat has been taken up in a latent form, as the air expanded, consumed as it were in lifting against the atmospheric pressure; this may be represented sufficiently well for us by assuming the temperature of the blast, kept to its normal volume, at 700° Fah.

This is as yet, however, but a very slight addition to produce results which so nearly approximate to those obtainable by the oxyhydrogen flame, seeing the latter has an estimated temperature of 14,000° to 15,000° Fah., while that of the present method does not much exceed $5,000 Fah. The gap, as far as effects is concerned, is narrowed so much, and in a manner so unexpected, by the results here given that one is naturally prompted to inquire whether the assigned temperature of the oxyhydrogen flame has been obtained by direct experiment or by caculations based upon the ascertained temperature of other flames. The temperature as calculated indirectly in this last way certainly furnishes us with figures remarkably close to those just quoted.—*Chemical News.*

Cements and How to Use Them.

A great deal has been written concerning different cements, and indeed our periodicals are full of recipes on this subject. But (says the *English Mechanic*), it will be found that the information given is rather in regard to the materials used in compounding these cements than in regard to the manner of using them. And it is unquestionably true that quite as much depends upon the manner in which a cement is applied as upon the cement itself. The best cement that ever was compounded would prove entirely worthless if improperly applied. We have hundreds of recipes for glues, pastes, and cements of different kinds, and yet the public is constantly on the *qui vive* for new ones,and no more acceptable recipe can be sent to our popular journals than one for a new cement. Now, the truth is, that we have cements which answer every reasonable demand, when they are properly prepared and properly used. Good common glue will unite two pieces of wood so firmly that the fibers will part from each other rather than from the cementing material; two pieces of glass can be so joined that they will part anywhere rather than on the line of union; glass can be united to metal, metal to metal, stone to stone, and all so strongly that the joint will certainly not be the weakest part of the resulting mass. What are the rules to be observed in effecting this?

The first point that demands attention is to bring the cement itself into intimate contact with the surface to be united. If glue is employed, the surface should be made so warm that the melted glue will not be chilled before it has time to effect a thorough adhesion. The same is more eminently true in regard to cements that are used in a fused state such as mixtures of resin, shellac, and similar materials. These matters will not adhere to any substance unless the latter has been heated to nearly or quite the fusing point of the cement used. This fact was quite familiar to those who used sealing wax in old days. When the seal was used rapidly, so as to become heated, the sealing wax stuck to it with a firmness that was annoying—so much so that the impression was, in general, destroyed—from the simple fact that the sealing wax would rather part in its own substance than at the point of adhesion to the stamp. Sealing wax, or ordinary electrical cement, is a very good agent for uniting metal to glass or stone, provided the masses to be united are made so hot as to fuse the cement, but if the cement is applied to them while they are cold, it will not stick at all. This fact is well known to those itinerant venders of cement for uniting earthenware. By heating two pieces of delf so that they will fuse shellac,they are able to smear them with a little of this gum, and join them so that they will rather break at any other part than along the line of union. But although people constantly see the operation performed, and buy liberally of the cement, it will be found that, in nine cases out of ten, the cement proves worthless in the hands of the purchasers, simply because they do not know how to use it. They are afraid to heat a delicate glass or porcelain vessel to a sufficient degree, and they are apt to use too much of the material, and the result is a failure.

The great obstacles to the junction of any two surfaces, are air and dirt. The former is universally present, the latter is due to accident or carelessness. All surfaces are covered with a thin adhering layer of air, which it is difficult to remove, and which, although it may at first sight appear improbable, bears a relation to the outer surface of most bodies different from that maintained by the air of a few lines away. The reality of the existence of this adhering layer of air is well known to all who are familiar with electrotype manipulation. It is also seen in the case of highly polished metals, which may be immersed in water without becoming wet. Unless this adhering layer of air is displaced, the cement cannot adhere to the surface to which it is applied simply because it cannot come into contact with it. The most efficient agent in displacing this air is heat. Metals warmed to a point a little above 200°, become instantly and completely wet when immersed in water. Hence, for cements that are used in a fused condition, heat is the most efficient means of bringing them in contact with the surfaces to which they are to be applied. In the case of glue, the adhesion is best attained by moderate pressure and friction. Another very important point is to use as little cement as possible. When the surfaces are separated by a large mass of cement, we have to depend upon the strength of the cement itself, and not upon its adhesion to the surfaces which it is used to join; and, in general,cements are comparatively brittle.

Fitting Down Sills Under Water.

It frequently happens that sills have to be fitted down to the bottom of the water, for the erection of mills, flumes, dams, bridges, and other structures, in situations where the water cannot be turned aside, or kept out without great expense, for coffer-dams, pumping, etc. The following method of obtaining an exact outline or profile of the bottom in all such situations, we have practiced for many years with invariable success:

The first requisite is a level surface on the water under which the sill is to be placed. To obtain this it is sometimes necessary to obstruct the surface current sufficiently to back and deaden the water as far as the sill extends; now fasten up a row of stakes along the intended bed of the sill, and nail a wide, thin board upon edge to these stakes, the entire length, the lower edge at the surface of the water (water line). An exact outline of the bottom, or bed of the sill, is transferred to, and marked upon the board by the following process: Fix two pieces of wood in the form of a T-square, the the tongue-piece longer than the depth of the water, and marked with feet and inches, like a ten-foot pole, the T-head about two feet long, and three or four inches wide, with a mortise through the middle in which the tongue-piece can slide freely up or down, and at the same time be kept plumb. Place the T-head on the edge of the board, and slip the tongue-piece down through the mortise to the bottom, and try the depth along the whole bed, until the deepest spot is found. Here cut a notch, or make a hole in the tongue at the surface of the water, to hold a pencil, and let one man hold the T-head with one hand, and the tongue with the other, moving both hands carefully along the board towards one end, feeling the bottom as he advances, while another man holds the pencil in the hole, marking all the rises and inequalities of the bottom upon the board, taking care to mark only when the tongue piece touches the bottom. When thus marked to one end, commence again at the same low place, and mark to the other end; and the outline of the bottom will be transferred to the board, with the relative level of either end or any other part indicated by the distance of the pencil mark from the lower edge of the board, which is the water line or true level.

The marked boards may now be taken down, and the portion above the pencil mark cut away, when the other portion left will be a pattern by which to fit the under side of a sill to the rock or bottom. It is sometimes better to take the pencil line some inches above the water line at the lowest part, and where the bottom is very uneven it is best to mark the sill by the pattern, so that only the slight inequalities will be cut out of the stick, which will not affect its strength, and where low spots in the bottom occur, short pieces should be spiked on to fill out the pattern. By this plan, such timbers can be fitted to a rock, or other bottom, under water, nearly as accurately as if dry, and with very little more expense.

This method of scribing down a mud sill under water, and the method of taking levels from water, as described in this chapter, are, as far as we are aware, our own inventions.—*The Practical American Millwright and Miller.*

PLINY states that the cedar woodwork of the Temple of Apollo, at Utica, was in a perfect state of preservation after an interval two thousand years. The famous statue of Diana of the Ephesians was formed of cedar, and endured for many centuries. The ancient Egyptians extracted an oil from cedar wood, which they rubbed over the leaves of the papyrus to preserve them from worms, and which also entered into the compositions used for preserving their mummies.

THE BRIDGE DE L'AISNE ON THE RAILWAY FROM SOISSONS TO LAON, IN FRANCE.

The bridge over the Aisne, in France, of which we this week give an engraving, is probably one of those which have been blown up by gunpowder during the present war. It is (or perhaps we shall have to say, *was*, when the full record of destruction shall have been written), a most beautiful structure of stone, presenting from the right point of view lines of the utmost beauty and grace.

It is what is known as a skew bridge, that is, it crosses the stream obliquely. Such bridges present special difficulties in their design and construction, arising from the fact that all the curves become changed from those necessary in a bridge placed at right angles with the banks, in proportion to their obliquity; arcs of circles becoming portions of ellipses, etc.

Notwithstanding these difficulties, the engineer of the Pont De L'Aisne, M. Martin, has succeded in producing a most beautiful design, and one that will bear more than a casual inspection.

There are mysteries in this bridge, impenetrable to the unaided eye or imagination of an American reader. Massive, imposing, and enduring as it appears, the piers which sustain its elegant arches, conceal a special provision for its rapid destruction, should the feet of a hostile and invading army attempt its passage.

It said by a French correspondent that M. Martin, when pointing out these magazines, designed to be charged with powder, in case of emergencies like the present, wept at the possible fate of his beautiful design.

Our readers may estimate from the elaborate character of this structure, which most of the French bridges possess in common with it, what the destruction of bridges in France really means. It means the destruction of almost inconceivable wealth of architectural design scarcely to be comprehended in our country of wooden trestles and "Cheap John" railway structures.

The Prussian army on its way to Paris have met with many similar structures which have been sacrificed in the desperate but vain attempt of the French to stop their advance. The Prussians express great surprise at this destruction, as they aver that it opposes little or no hindrance to their progress.

THE BRIDGE DE L'ASINE, IN FRANCE.

Cellars.

The following useful hints regarding the construction of cellars, from an article appearing in the late issue of the London *Architect*, are especially valuable in this country, where our cellars are, as a rule, lacking in the most desirable features of underground rooms:

"The cellar of a house may be likened to the lower hold of a floating ship, and a like difficulty attends the ventilation of both. The first thought is that of the extraction of the foul air Cellars are not always ceiled, and, even when they are, it is in such a coarse manner that the defense thus made against rising exhalations and the effect of a damp atmosphere upon the floor above must be very slight indeed. Some persons fancy that to flag or cement the cellar floor and walls is a preventive of noxious gases forming there. But this is a fallacy. The lower hold of a ship is subject to a similar state of noxious air settlement, but even this has a less influence for mischief upon human existence than has the cellar under the dwelling house, for the tenants of the latter are experiencing the injurious effects for a lifetime, whilst the passengers and crew of a ship have the limit of a voyage to their experience.

"The difficulty in remedying this necessary evil of cellars lies in the perfect expulsion or extraction of the stagnant fetid atmosphere, and this can be effected by either revolving fans, exhausting a flue or flues (either vertical or oblique), or by forcing pumps, propelling fresh external air into, and thereby driving the foul air out of the cellar. There are other means, however, such as the chimney. And, as heat is a conductor which can thus be easily made available, we have at once a solution of the problem of extraction in the simple addition of a continuous flue from cellar to chimney top, which may also have one of the simplest of the patent revolving ventilators, now in use, attached to it. As an aid to this vertical ventilating flue, we would have another flue for the reception of external fresh air at the ground level, which would supply the place of the retreating foul air, and thus maintain a wholesome current; or, at least, a constant change of atmosphere. In order to build the chimneys to suit this principle of ventilation, it is only necessary to construct two flues four inches square, one at either side of the fireplaces, and occupying a position in the chimney breast nearest the fireplace.

"The object in having two of these four inch flues is to balance each other, and, at the same time, to give in the second one a very desirable servant in any household, namely, an ash-shoot, through an iron trap in which, located on a level with the hearth, the embers, dust, and ashes may be cleanly swept and be instantly precipitated to a receiver or close dust-bin in the cellar. It would be very desirable to have both of these flues made circular, which could easily be effected by the mason using an open tin cylinder, with a handle at the upper end by which he could draw it up as he proceeded with his work. Around this cylinder he should plaster close with lime and cement, in equal proportions, against three times as much sand. Of course, these flues may be square or ever oblong; but, of whatever shape they may be, it is absolutely necessary that they be carefully pargeted or lined with plaster.

"A more expensive, but far more perfect method of ventilating cellars, would be to ceil over the whole space, and place ventilating thimbles at intervals between the joists. In this way, the spaces between joists may be made to act as air tunnels, having grated openings in to external walls. In order to thoroughly purify the atmosphere of these under ground rooms, called cellars, where a stream of water from a spring is available, a cemented drain, open on top, is excellent for the purpose, the current carrying off all mephitic gases and creating ozone, the purest of atmospheres. Where a running stream from a pure spring cannot be had, its place may be partially supplied by the use of the hydrant at one end and a small pump at the other, thus letting the water in from the street in a continuous stream, running through the cement channel already spoken of, and drawing it off at the other end, unless the sewer be below the bottom of a cellar, in which case the pump is not needed. This artificial flow of water should take place twice each day—in the evening to cool the atmosphere, and in the morning to clear off the exhalations of the past night."

How to Make Cuttings Grow.

Alluding to the manner of propagating cuttings the *New England Farmer* says that it has been ascertained that a cutting will develop roots much sooner in moist sand than in rich soil. But the sand cannot maintain its growth for any length of time. To prepare pots for raising cuttings they should be filled nearly to the brim with rich garden loam, dark and porous, not clayey and soggy; then pour in one inch in depth of scouring sand; sea sand will do as well as the yellow sand. Wet this thoroughly, and place the cuttings, from which all but three or four upper leaves have been removed, close to the side of the pot; the contact of the ware against the stem of the cutting promotes its growth. Press the wet sand firmly around the tiny stem. A great deal of your chance for success in raising slips or cuttings depends upon this.

Plant as many cuttings as the pot will hold, from six to a dozen, according to the size of your pot; when they are firmly set in the sand, two or three can be inserted in the middle of the pot. Set them away in a dark, warm place for twenty-four or thirty-six hours. Thus, cuttings will grow quickly in a hot bed, because the temperature is not dry. Their growth depends a great deal upon light, heat, and moisture.

It a bud is close at the base of a cutting it will strike root more easily—is not so apt to decay. The roots shoot from a bud, and the lower down it is the surer your success. When the leaves drop, the plant is commencing to grow; if they wither on the stem, it has begun to decay. By following these directions no one can fail to grow all kinds of house plants. Roses and all the rarest flowers of the green houses are propagated in this manner.

INVENTORS will be well repaid for the careful perusal of the decisions ot Commissioner Fisher, published elsewhere. The reprimand administered to the patent agent for offering bait appears to be well deserved. It will serve also to warn inventors not to nibble at every bait that is thrown out to catch them.

IMPORTANT PATENT OFFICE DECISIONS.

Commissioner Fisher has refused the application of Wm. Mont Storm for an extension of his patent for an improvement in revolving fire-arms. This is one of the applications authorized by Congress to be made after the patent had run out. An extension was granted to Emily J. Lamson, executrix of Daniel Lamson, for improvements in machines for notching hoops. The evidence shows that this invention was a valuable one, and that the inventor, who was a poor man, was diligent in attempting to introduce his invention until the breaking out of the war, when he enlisted in a Massachusetts regiment and was killed at Fredericksburg. Since his death his widow has continued the manufacture, but with small profits. The commissioner says: "This case is one in which it is eminently proper that an extension should be granted." In the interference case of E. Hewins and D. B. Spooner, applicants for a patent for a water meter, the commissioner affirms the decision of the Board of Appeal, pronouncing Spooner the real inventor. In his decision he is rather severe upon Hewins and the several other members of the Baldwin Patent Meter Company of Boston. One of the party, Mr. Frederick Curtis, comes in for a merited castigation, as follows:

"In the course of the testimony a letter from Mr. Frederick Curtis, of Boston, a solicitor of patents, and one of the parties named above, was put in evidence. I do not see that this letter is relevant to any of the issues of this case, and I have given no weight to it as testimony. I refer to it now, as the publication of this opinion affords me a convenient opportunity of expressing the view which I entertain of its contents.

"The letter was written in February, 1869, to Spooner, in relation to obtaining the second patent upon the Baldwin meter. In this letter Curtis says: 'I have a way now of obtaining the allowance of a patent in six hours after it reaches the Patent Office, by the payment of $75, and I intend to have large fees paid me in excess of this for accomplishing this sort of thing.'

"The first remark which this statement demands is that it is false in fact. No soliciter or any other person has 'a way of obtaining the allowance of a patent in six hours after it reaches the Patent Office.' Cases are received, recorded, and examined in their regular order. They do not reach the examiner until a day or two after they are filed, since they must pass through other rooms, when the fees are received, the cases classified, the application completed, the files made up, and other formal matters attended to. The examiners, under the great pressure of the numerous applications submitted to them, cannot reach a new case under a week or two after it comes into their rooms, so that, under the most favorable circumstances, the thing asserted in this letter is simply impossible. No order is ever granted, under the present administration of the office, to take cases up out of turn, except as provided in the printed rules, even when inventors have come to Washington to attend to their own application, and this because it is simply just that those who send their cases to the office, and trust to the operation of its rules, shall not be set aside at the demand of the clamorous few who choose to attend in person or to demand special privileges by friends or attorneys. The rule is imperative, and it has been faithfully and rigidly adhered to.

"But the writer of this letter intimates that this just rule may be set aside by the payment of money. Cases may go through in six hours, he says, 'by the payment of $75,' and the advantage of knowing this secret he deems to be so great, that he 'intends to have large fees paid to him for accomplishing this sort of thing.

"This insinuation is also false. It is simply a libel on the Patent Office, a libel which has no foundation in fact. Mr. Curtis never had a patent allowed in six hours after the application reached the Patent Office, and he never paid to the Patent Office, or any officer thereof, $75 or any other sum, to secure the allowance of cases out of their regular order.

Inventors ought to know that if they are foolish and wicked enough to pay their money upon such pretenses, it will never reach the pockets of the Government officials for whom they suppose it to be designed. It goes no further than the unscrupulous attorney or agent, who, assuming to trade upon the supposed corruption of sworn officers, is willing to slander honest men, and destroy public confidence in the administration of public affairs, in order that he may enrich himself at the expense of his credulous client.

"Instances have come to my knowledge where money has been extorted from clients by agents after patents had actually been allowed but not yet issued, upon the pretense that it was necessary to bribe the examiner. I know of no case where the money went beyond the solicitor. No practitioner can assert with truth that he possesses any facilities by which he is enabled to procure patents in advance of any of his competitors beyond his knowledge of the forms and routine of the office, and his skill and care in the preparation of his cases. To take money from his clients under the pretense that it is to be used to procure such facilities is to add theft to falsehood."

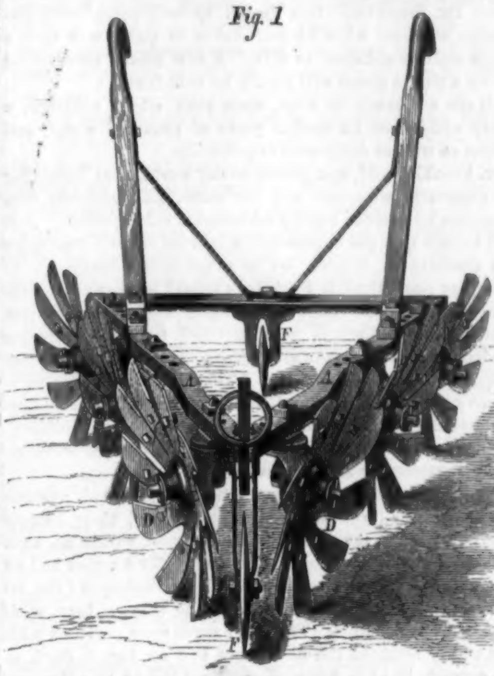
Georgia State Fair.

This Fair will be held at Oglethorpe Park, Atlanta, opening the 19th of October, and closing October 29th, 1870. The manufacturers of machines, implements, instruments, tools, etc., are requested to send their latest published illustrated catalogues and price lists. The secretary requests the contribution of specimens of their machines, etc., for preservation and permanent exhibition in the museum, upon such terms as to expense of thus advertising for the manufacturers as may be agreed upon with the secretary. The arrangement of the office and museum will be designed for the exhibition and advertisement, to the best advantage of all articles thus intrusted to it. Address Col. D. W. Lewis, Secretary, Atlanta, Ga.

BUSSELL'S DISK CULTIVATOR AND HARROW.

We are informed that the implements herewith illustrated are only part of a series, covering the entire range of ground breaking and culture, the same leading elements running through the whole series. They are based on experiments which have extended through the last sixteen years, having

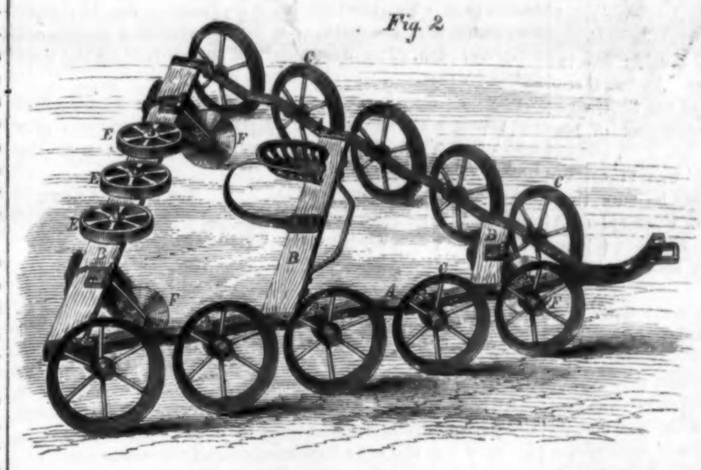
Fig. 1



in view the production of cheap machines to pulverize soil with the least possible expenditure of force, and, at the same time, to bring the subsoil to the surface and thoroughly incorporate it with the surface soil. It is claimed that these ends have been satisfactorily attained.

The cultivator and the harrow are substantially the same—the latter being an enlargement of the former, and provided with a seat for the driver The serrated and continuous rimmed

Fig. 2



disks are interchangeable and may be used on both; the continuous rims being preferable in stalky, trashy, or sod ground.

The armed disks are preferable in crop culture, when stalks and roots do not interfere. They are journaled to swivel brackets which allow of quick and easy changes in the position—*i. e.*, these concavo-convex disks can be turned more or less quartering across the line of draft, according to the requirements of soil and crop.

A is the frame, made of angle iron, and B, the cross-ties of wood binding the sides of the frame; the continuous rimmed disks C, on the harrow, have wrought iron spokes (the rim being cast *narrow*), which form leaves large openings for the

Fig. 3

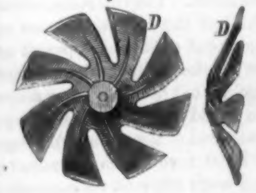
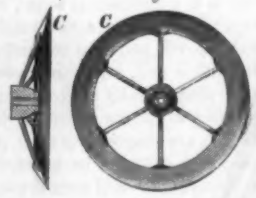


Fig. 4



surface soil to drop through while the rim comes up loaded with the subsoil. It is claimed that this secures level and thorough culture. The armed disks having blade-like points are shown at D, the front edge of each being turned out slightly towards the convex face. These blades penetrate the earth edgewise, gyrate laterally, and emerge laden with the subsoil shedding it in the direction of the row, while the weeds drop through the interstices and are buried out of sight. E E are carrying wheels for transporting the harrow from place to place. They are put into the swinging brackets, where the coulters, F, are used when in the ground.

These coulters serve as rudders to steady the running of cultivator and harrow, which it is claimed they do perfectly.

We have never seen this machine at work, and can speak of it only on information forwarded by the inventor. Only actual experiment can demonstrate the validity of his claims, which are for the cultivator, that it has one half less draft than any other cultivator in use; that it does twice the work of any other cultivator, and does it better; that it destroys the weeds more effectually than any other machine; that it cultivates one row *perfectly* at once going through, which no other machine does; that it leaves the ground smooth and level between the rows; that it completely pulverizes all clods, and throws the fine subsoil closely and evenly around the roots; that it largely increases production, by thoroughly loosening and mixing the soil; that it will work wet soil better than any other implement, and leave it in better condition; and that it is cheap and durable, and not as liable as other machines to break or get out of order.

With these claims for its superiority, we submit it to a fair competition with its rivals.

It is claimed for the disk harrow and pulverizer, that it will soon save its cost in horseflesh, owing to its light draft; that it will thoroughly pulverize the soil from four to six inches deep; that it is the best clod-crusher yet invented; that it will thoroughly mix fertilizers with the soil; that it is the best machine in use for preparing sod ground for corn; and that it is simple in construction, cheap, and not liable to get out of order.

Patented, August 9, 1870. Manufacturers' and State rights for sale by the proprietors, Bussell, Tilford & Greene, Indianapolis, Ind.

Swiss and Limburg Cheese.

We learn from the Wisconsin *Farmer*, that within a few miles of Oshkosh, Wis., there will be 50,000 pounds of Swiss cheese made this season. John Ryf, a native of Switzerland, was the pioneer in the business in the vicinity, having commenced work ten years ago. He brought to Wisconsin in that time $700. He now has a farm of 190 acres, with buildings on it which cost $10,000 in cash—the cow barn being a particularly good one—the profits of Swiss cheese making. This year he is making cheese from about 50 cows; commenced manufacturing May 1, and has already a good supply of cheese.

The milk is "set" as in American cheese manufactories. It is heated in a copper kettle, holding 125 gallons, to about 122° to 125°. No salt is put in the curd. A lever instead of a screw press is used. The cheeses are thirty inches in diameter, and about four and a half inches thick, weighing from eighty to one hundred and ten pounds. Salt is rubbed in every day for two or three months, then once in two or three days until cold weather, and then once a week. The cheese ought to be at least one year old before being used, and the older it is the better it is considered. There are small holes in the cheese, and if these are about the size of peas this is considered an evidence of excellence. When the cheese is old these holes become full of butter.

The cheese-room on this farm is small, and no curing room is attached, the cheese being cured in the cellar under the dwelling house. This cellar as well as all about the cheese house, was quite clean, and the entire place gave evidence of good management, neatness, and cleanliness. The cheese, however, would hardly be popular with Americans, either to smell or taste. Yet there is a good demand for it at good prices. Last year Mr. Ryf's sales were made at an average of twenty-two cents, delivered at Oshkosh, going to the Milwaukee market. He has sold it as high as thirty cents per pound.

There are some four other dairies in the neighborhood making this cheese. We had only opportunity to visit one other, that of Messrs. Bess and Kettle, on the farm of C. L. Rich. We did not find either of the cheese makers. They are engaged somewhat in making.

The Limburg cheese is made in small brick-like pieces, weighing about two pounds each. The milk is not heated after being "set," nor is the curd stirred. The curd is put in small boxes, and pressed only with the hands. As with Swiss cheese, the salt is rubbed on the outside. The cheese are inclosed in tin foil. Owing to the less pressure a greater quantity of cheese can be made from a given quantity of milk than with American cheese—eight pounds milk will make one of cheese. Last year the average price of Limburg cheese at Oshkosh was about fifteen cents.

Analysis of German Silver.—A good method of separating copper, nickel, and zinc, is to dissolve the alloy in hydrochloric acid containing a few drops of nitric acid, and precipitate the copper from the slightly acid solution in the form of sub-sulphocyanide of copper. The liquid, after being filtered and reduced, by evaporation, to a small bulk, is treated by excess of caustic potash, and then by hydrocyanic acid, until the precipitate which is at first formed is completely re-dissolved with a yellow color. In this liquid, which contains the double cyanides, the zinc is precipitated in the state of sulphide, by means of protosulphide of potassium (not sulphide of ammonium). After some hours' digestion, and when the precipitate is completely deposited, it is filtered off, and, after boiling the liquid with *aqua regia*, the nickel is precipitated as oxide by caustic potash. This oxide must be calcined after it is dried.—*F. Wöhler*.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Steamboat Speed—The Rams "Avenger" and "Vindicator."

MESSRS. EDITORS:—My attention has been called to an article in the SCIENTIFIC AMERICAN, of the 10th inst., on the subject of "Steamboat Speed," in which reference is made to Hill & Payne as the builders of the rams *Avenger* and *Vindicator*, of the war fleet on the Mississippi, with the apparent expectation that we would furnish the public with some information on the subject. Not being used to appearing in print, I feel diffident in writing for your able journal; but if a plain statement of some facts in reference to these remarkable boats shall be deemed worthy a place in your columns, you are welcome to it.

The plans of the rams were designed to carry out to a moderate degree, a theory of ship-building of Mr. R. Germain, of Buffalo, N. Y. We confess that at first we had not much confidence in it. The scientific arguments which he advanced in support of it seemed very strange, but the conclusions which he drew seemed so startling, and, judging by our experience and observations, so improbable, that we shrank from them. We could not but think that some important fact had been overlooked, a fatal error made in his calculations.

We did not expect that these vessels would be failures, but we would have been satisfied had they only developed a full average speed of boats of their size, power, and draft, which would have been some nine or ten miles an hour.

These rams were wide in proportion to their length, as compared with most river crafts.

The *Avenger* had 40 feet beam, and a length of 180 feet; the *Vindicator* had the same beam, but was 210 feet in length. They were built very strong and heavy, with thick casemates of solid timber, and had heavy armaments. Their bottoms were flat, with the exception of the ends. Each of them drew, when light, about six feet of water, while most boats on the Western rivers draw, when light, from two feet to four feet—rarely as much as four feet.

Their power was about the same as ordinary boats of this size—no more. Their models were very peculiar, but there was in them nothing to offend the eye or to suggest a want of adaptation to purposes of utility; on the contrary, they were highly symmetrical, and rather beautiful than otherwise. They looked, as some one quaintly described the *Vindicator*, which was the best embodiment of Mr. Germain's principles of construction, as "spoiling for a race."

He claimed that the *Vindicator* would be able to run sixteen miles an hour. The *Avenger* he did not expect would be as fast. Sixteen miles an hour would be at least one third faster than any boat on the river of their general dimensions, power, and draft. He seemed to stand pretty much alone in his opinion with the exception of two or three. Among them the late Capt. James Brooks, quartermaster of the fleet, who had looked pretty thoroughly into the evidences of his theory.

When the vessels came to be tried there was of course much curiosity to see the result, and you may be sure that there was as much delight as surprise felt at their splendid success; for instead of falling short of his representations, which have been deemed extravagant, it was seen that they were excelled.

I have never seen these vessels since they went down the river to join the squadron, but it was notorious among river men that they were very fast.

As an amusing evidence of the disbelief that they would be fast, I relate the following incident: The *Avenger* was first ready for a trial of speed, a gentleman who had charge of the details of construction—a man of great intelligence and much experience as a steamboat man—fearing that, as they was about to start off, she would not be able to stem the current of the river, about 4 miles an hour, advised that a hawser be attached to prevent her floating too far down the river, as it might not be convenient to get her back again.

You may imagine his surprise when a few minutes there after he saw her running up stream with great swiftness. I have since given much reflection to these principles of construction. There seems to be no guess work in Mr. Germain's calculations. All his conclusions are the result of calculations and demonstrations, based on the operations of the laws of fluids, as ascertained by his own experiments; and from the accuracy with which he foretold results, and from the logic of his arguments, I am convinced that his method is the true one to get the highest speed, at the least expense, in navigation.

Whether his expectations will be realized to the extent he states them—to wit.: to double present velocities without the employment of more power in proportion to the size of the boat—I can't say; but by his method much higher speed than has yet been made by steamboats can be attained, I have no doubt.

If this is so, it must sooner or later revolutionize travel and transportation on the water, and be of incalculable benefit to the country.

Why he has held his theory, back from further development, I do not know; but whatever the cause, it is to be hoped it will not long prevent its publication.

I must not fail to mention another important item with reference to the boats, as connected with our river navigation; when the rivers are often crooked and narrow, the *Vindicator* and *Avenger* were found to be most excellent steering crafts—their pilots declare them to be the best steering boats they had ever handled.

A correspondent in your issue of August 6th on the same subject, "Steamboat Speed," stated that the *R. E. Lee* was built in Louisville. This is an error. She was built by Hill, Roberts & Co., of this place; but not on the same plan as the two rams *Vindicator* and *Avenger*.

D. C. HILL, formerly of the firm of Hill & Payne.

New Albany, Ind.

Lightning Rods.

MESSRS. EDITORS:—I read with interest in the SCIENTIFIC AMERICAN of Aug. 27th, an article entitled "Thunderbolts and Lightning Rods," in which the writer seems to set aside the theory promulgated to the world by our scientific forefather, Dr. Franklin. One should be well armed with formidable weapons when he undertakes to make war upon a fact as well established as this. A few hours' observation during a single storm will hardly be sufficient.

All are not ready to drop, upon such slight evidence, a theory which cost its author years of profound study, and tedious as well as dangerous experiments.

Dr. Franklin said, and proved to the world, that lightning and electricity were one and the same, and scientific men who have lived since his day corroborate this opinion. It is well known that the approach of a pointed metallic conductor will discharge a Leyden jar or other object charged with electricity; and thus, if Franklin's theory be correct, the approach of a metallic conductor will discharge the electricity from a cloud, which is nothing more than an enormous Leyden jar floating in the atmosphere. The first rod erected by Franklin was on a house in Philadelphia; and during a severe storm which followed, this rod conducted discharges of electricity to the ground without injury to the building, while other buildings in the city, having no rods, were severely shattered by similar discharges.

We have in this vicinity experienced an unusual number of casualties by lightning the present season, there having been no less than seventeen buildings struck within an area of thirty miles in diameter. Ten out of the number had no rods, and eight of the ten were entirely destroyed; the remaining two, one a brick house, and the other a barn, were shattered but not fired. The other seven were provided with rods which received the discharges and conducted them to the ground, in each instance, without doing any damage whatever to the buildings, notwithstanding most of them were filled with freshly cut grain and grass.

We may suppose that there are conditions in which such accidents might happen as your correspondent speaks of, for instance: 1st. An erroneous construction of the rod, by which its area of conducting surface is too small, and, as a consequence, too easily overcharged. 2d. Imperfect insulation by permitting the rod to remain in contact with the combustibles of which the building is composed. 3d. Imperfect connection with the earth, that is, not reaching permanent moisture. 4th. The destruction of the surface of the conductor by rust.

Any one or even all of the above conditions do not affect the principle or preclude the construction and erection of a conductor which shall afford a perfect protection from the fearful effects of lightning.

Barnesville, Ohio. THOMPSON FRAME.

Balancing Cylinders.

MESSRS. EDITORS:—The correct principles for balancing cylinders, pulleys, etc., seem to be very imperfectly understood, and the practice consequently bad and unsatisfactory.

C. E. M., of N. Y., is in trouble, and many others have like troubles when they claim and honestly think—erroneously—that they have their machinery perfectly balanced and mechanically correct. A cylinder or pulley should be balanced in each and all its parts in lines of its circumference, and in no other way can it be done mechanically correct.

W. O. Jacobi, who, although he fails, in his article in the SCIENTIFIC AMERICAN, of September 3d, to fully express the mechanical action of such a well-constructed and balanced cylinder, doubtless understands the correct principles of "balancing." He supposes a cylinder some four feet long to be perfectly balanced, and then that a hole be bored in the end of one end of a stave, and a pound of metal inserted. Now the cylinder will be so much out of balance. He then inserts in the opposite end of the cylinder, on the opposite side, an equal weight, and says it will be balanced again if laid on level parallel steel bars, but will be out of balance while running.

Now, I hold that a cylinder so weighted at one end and counter weighted on the opposite side at the other end, is *not*, in any mechanical sense, balanced. The two sides, taken as a whole, are of equal weight, but the cylinder is out of balance, one pound at one end and out of balance a pound at the other end, and the center of the cylinder lengthwise and diametrically is the only point that does not show a disposition to vibrate when put in rapid motion on its bearings (which are supposed to be at each end of the cylinder). Suppose such cylinder to be run 3,000 revolutions per minute, the bearings would soon become worn away on the same side of the weights; one end of the shaft on one side and the opposite side at the other, and the centrifugal force of the extra weight inserted would continually keep that side bearing on the box and heating and wearing, and were it not bound down by the boxes the motion of the shaft would be something like the double crank of a fulling mill, one end one way and the other *vice versa*.

The practice of balancing the heavy side of one pulley with the heavy side of another pulley on the same shaft, and many times some distance apart, is very pernicious, and should not be tolerated, yet many millwrights and machinists who claim to be scientific mechanics, practice it, not knowing the correct, and in fact possessing no knowledge of moment of inertia. S. H. BARNES.

Lanesboro, Pa.

The Side-Saddle Flower, or Hunters' Cup—"Sarracenia."

MESSRS. EDITORS:—In your issue of September 3, you copy an article from *London Society* describing a curious fly-catching plant among the flowers in Paris. I may be in error, as there is some difference in the description, but I suspect that it is nothing more than our Side-sadddle Flower or Hunter's Cup, which was first sent to Europe in 1752, by Dr. Sarrazin, from which circumstance, it acquired its botanical name *Sarracenia*

I send you two extracts describing the latter plant, one from Comstock's Botany, the other from the Botany of the State of New York, by Mather.

SARRACENIA.

"We have one native plant growing in the peat bogs of New England, whose leaves hold water. This is the Side-Saddle Flower. Its common name is derived from the resemblance of its stigma to a woman's pillion. The stem rises a foot high and bears a singular but beautiful purple flower. The leaves, which are hollow, are from four to eight to each root and surround the stem like radii from a center, and rest upon the ground. They are of oblong form, swelling in the middle, and gradually contracting to form the stalk. Their open mouths, which are of considerable size, are somewhat elevated and contracted at the border, so that in the natural position they retain the water when nearly full, and on the lower side of the mouth is a broad spreading appendage which catches the water, and directs it into the cup. These cups contain a wine glass of water, and unless pierced by some insect, are seldom empty."—COMSTOCK.

"Common to our swamps and boggy ground is the Side-Saddle Flower, or Hunter's Cup (*Sarracenia*), bearing a single nodding, dark, red flower, a wonder in itself, but more so, when viewed in connection with the wonderful structure of its leaves. These are not flat as in other plants, but hollow and somewhat pitcher-shaped, arranged in a circle around the base of the stem, their open mouths turned upwards to catch the falling rains. At the orifice of each leaf is a broad lip, furnished with short, stiff hairs pointing downwards and forming a trap for numerous insects that seek the water contained in them. A luckless fly once entered, it is impossible for him to return and he is forced to go onward until dropping, he perishes in the water beneath. Of what use in the economy of the plant these dead insects are (the cup being often half filled with them), is not as yet well known, but possibly they serve in some degree for nutriment."—MATHER.

ALEX. ALLAN.

Curious Freak of a Thermometer.

MESSRS. EDITORS:—My attention was this evening called to a thermometer that has been in use in an ale brewery for some months past; it is used for getting the temperature of the liquor while in process of making.

The manner of using it is to immerse the bulb of the instrument in the liquor for a short space of time and then withdraw it. The bulb of the instrument having a vessel formed around it for containing a portion of the liquor.

The last time it was used it was immersed in a vessel of water at boiling heat, the mercury ascending immediately to the top of the tube (which is two inches above the boiling point indicated on the instrument), and there remained; although separated at several places in the tube it seemed immovable.

The mercury remaining in the bulb seemed to be in its natural state, but that in the tube seemed to be solid. The experiment of placing the instrument in a very warm place was tried, but without any effect upon it; next was tried making it as cold as possible by putting it in a quantity of salt and ice. This was also without effect; it still remains in the position as when first taken out of the boiling water.

An explanation of the cause of the mercury remaining in the tube of the instrument through the columns of your valuable paper will be thankfully received.

Connellsville, Pa. R. L. C.

Water a Solid.

MESSRS. EDITORS:—I believe that water is practically solid under a swift moving substance, and that the surface of it may be used as a safe and free course of transit, analogous to the railroad on land.

That water is solid, to all intents, under such circumstances, is shown by the cannon ball, which, being fired at an angle, upon its surface, is seen to ricochet until its motion is so far expended that it is left free to sink.

Zanesville, Ohio. JAS. GRANGER.

The Seventeen-Year Locusts.

MESSRS. EDITORS:—A Boston paper (the *American Traveler*), generally accurate in the minutest dates of history, illustrates the familiar proverb that "Jupiter occasionally nods."

It appears that some author had found a cycle of seventeen years in the Napoleonic dynasty, and the *Traveler* not satisfied with showing various falsities in the statement, concludes that it is "as ridiculous as the seventeen-year locusts." Nor is this skepticism confined to the intelligent Boston editor, inasmuch as a leading New York daily doubts the periodical recurrence of the *Cicada septendecim*.

Now there is no fact better known in all scientific circles, and, indeed, universally through the Middle States, than this locust cycle thus called ridiculous. "If," says the Baltimore *Sun*, "the thorough and admirable work on this kind of locust by the late Dr. G. B. Smith, of this city, who had made

this subject a specialty, and embodied the labors of a life in it had been obtained and published by some of the scientific associations, there could scarcely be such ignorance of the most remarkable and interesting facts in natural history as thus exhibited." SEPTENDECIM.

How to Take Off the Fat---Defense of Banting's System.

MESSRS. EDITORS:—In your issue of the 17th instant, on folio 185, you quote an article from *Hall's Journal of Health* on "Fat People," deprecatory of a plan pursued by "Bantam" for the reduction of their adiposity, and in praise of and recommending what purports to be a different and much better system for effecting the same purpose. This is not the first time I have read articles of a similar purport from the same authority.

Assuming that the writer means by "Bantam" William Banting, of Kensington, England, who has published several editions of a "Letter on Corpulence," in which he narrates the means employed by him to rid himself of a great excess of bulk of person, I, with your permission, beg to offer a few words in reply.

It is to be particularly noted that in the article referred to, although a "fleshy gentleman" is spoken of who "began to Bantamize" as well as "Bantam's plan for getting lean," no explanation or description whatever of the "plan" is given; the inference of course is that it is entirely different from the one recommended for the same purpose by the writer of the article.

I will quote from both writers. The one in the *Journal of Health* says:

"The very best and safest way to get rid of fat is to work it off; this may be aided by eating food which contains a large amount of nitrogen and a small amount of carbon. Nitrogenous food is that which gives strength, power to work, as lean meats. *Carbonaceous foods are those which make fat, such as cheese, potatoes, rice, corn, peas, beans, tapioca, arrow root, cornstarch, milk, sugar, sirup, and all oily and fat food;* but, after all, the great reliance should be on exercise and work in the open air." (The italics are mine.)

Mr. Banting says:

"I have proved very satisfactorily that my greatest dietetic enemy was and is sugar and saccharine elements. I have ascertained by repeated experiments that five ounces of sugar, distributed equally over seven days, augment my weight nearly one pound by the end of that short period."—"I very seldom take any butter; certainly not a pound in a year."—"I seldom take milk."—"I occasionally eat a potato with my dinner, possibly to the extent of one pound a week."—"My impression is that any starchy or saccharine matter tends to the disease of corpulence in advanced life."—"I am thoroughly convinced that it is QUALITY alone which requires notice, and not *quantity*."—"I take the most agreeable and savory viands, meat and game pies, that my cook can concoct, with the best possible jellies, gravies, etc., the fat being strained off; but I never, or very rarely, take a morsel of pie or pudding crusts."—"*Quality* in food is the chief desideratum, and *quantity* is mere moonshine."—"The items from which I was advised to abstain as much as possible were bread, butter, milk, sugar, beer, and potatoes, which had been the main (and I thought innocent) elements of my subsistence."—"'These,' said my excellent adviser, 'contain starch and saccharine matter, tending to create fat, and should be avoided altogether.'"—"My former dietary table was bread and milk for breakfast, or a pint of tea with plenty of milk, sugar, and buttered toast; meat, beer, much bread (of which I was always very fond) and pastry for dinner, and generally a fruit tart or bread and milk for supper. I had little comfort and far less sound sleep."—"Corpulence, though giving no actual pain (as it appears to me) must naturally press with undue violence upon the bodily viscera, driving one part upon another, and stopping the free action of all."—"I do not recommend every corpulent man to rush headlong into such a change of diet, but to act advisedly and after full consultation with a physician."

Six years after printing the first edition of his work, and at seventy-two years of age, Mr. Banting says: "I can conscientiously assert that I never lived so well as under the new plan of dietary which I should have formerly thought a dangerous, extravagant trespass upon health," and he was then reduced thirteen inches in girth and fifty pounds in weight, and cured of several grievous bodily ailments.

My quotations from to the fourth edition of Mr. Banting's work, entitled "A Letter on Corpulence," and published by Harrison, 59 Pall Mall, London. It contains addenda of, I should say, letters from one hundred individuals of all ages—both sexes—and various situations in life, who have tried and succeeded admirably with his system. He says he has 1,800 such.

Query: Does the author of the article you quoted really know what the "plan" is he seeks to throw discredit on? Those who read the above extracts may decide.

Query, again: Where is the proof that the "fleshy gentleman's" "dangerous malady" was induced by following the plan of Mr. Banting? Who paid more or greater attention to his diet than Capt. 'Barclay, the great English pedestrian," referred to, in his own and in the training and preparation of others, for the necessary reduction of body preparatory to unusual corporeal or muscular efforts?

The writer of the article quoted says: "After all, the great reliance should be on exercise and work in the open air." Capt. Barclay did not think so. Do not those in active preparation for pugilistic or athletic feats depend as much upon an especial diet as upon exercise to accomplish the desired reduction in their weight? Did not Mr. Banting, following medical advice in this particular, exercise faithfully and constantly in the open air, and not paying proper regard to his diet rapidly *increase* in weight by so doing?

Not agreeing with the author of the article in Hall's *Journal of Health*, that if a man is "as big as a hogshead," and sleeps soundly and has a good appetite he had "better let himself alone," two years ago the writer of this, weighing at the time 200 pounds made a radical change in his diet, pretty much in the manner indicated by Mr. Banting. Neither "Bright's disease" nor any other "dangerous malady" has as yet developed itself; on the contrary, in three months he was, and has ever since remained, thirty-two pounds lighter in his weight, with a variation, according to circumstances, of but one or two pounds. He has been stronger and better in many ways than ever before, and is a firm believer, with many writers of eminence, that "excessive fat is a disease," and that its cure is effected by a simple change in diet, far superior to that generally indiscriminately followed.

In a letter recently received by the writer from Mr. Banting, he says: "I continue in good bodily and mental health; am in my seventy-fourth year, and maintain my normal condition; few men of my age more active."

Excuse the length of my communication, but every little while I see in some paper or other a dab at "Bantam's" (unkind cut) or Banting's system, and sometimes by those who evidently have not the slightest knowledge of what said system is; in this case I feel hurt to see one of your influence disseminating an article containing sentiments doing manifest injustice to a man who sought to do good to a great portion of his fellow men from no other than the kindest motives and without a shadow of desire for pecuniary reward.

Malden, Mass. J. H. B.

Obituary---Death of Thomas Ewbank.

The Hon. Thomas Ewbank, whose death was briefly announced in our last number, was throughout his long life an enthusiastic student of the natural and the exact sciences, and he acquired distinction in their pursuit. His book on hydraulics has taken a place among standard literature, and his other writings rank with the best scientific and philosophic works which this country has produced. His abilities gained him the appointment of Commissioner of Patents under President Taylor, an office which he filled for several years.

Mr. Ewbank was born at Barnard Castle, Durham, England, in 1792, and at the age of 13 was apprenticed to a tin and copper smith in his native place. When he was 20 years old he went to London, and succeeded in getting employment there at making cans for preserved meat. He succeeded in saving enough from his wages to purchase a few books, and to them every hour he could spare from his work was devoted. During the seven years he stayed in London he pursued a comprehensive course of scientific study. He had been elected a member of several learned societies and was on the high road to business prosperity, when in 1819 he gave up his English prospects and came to New York. Here he occupied for a short time the factory at Powle's Hook which had belonged to Robert Fulton. In 1820, he engaged in the manufacture of lead, tin, and copper tubing, which business he carried on until 1836. Since that time he has devoted himself entirely to his private pursuit—science. His first published work, "A Descriptive and Historical Account of Hydraulics and other Machines for raising Water, both Ancient and Modern," appeared in 1842. In 1849, he was made Commissioner of Patents, holding that position until 1852. His annual reports to Congress during this time were distinguished for the amount of information and of original suggestion they contained in them.

In 1855, he published "The World a Workshop; or the Physical Relation of Man to the Earth," and in 1857, an interesting volume entitled "Life in Brazil; or the Land of the Cocoa and the Palm," embodying the results of a visit to Brazil, made in 1845. This work contained valuable illustrations of ancient South American arts, and of antique works in stone and metal found in Brazil. In 1859, the "Reminiscences in the Patent Office, and of Things and Scenes in Washington," appeared. Among the best known of Mr. Ewbank's minor works were an essay called, "Thoughts on Matter and Force," published in 1858; an essay read before the American Ethnological Society on "The Inorganic Forces Ordained to Supersede Human Slavery"; an essay on "Experiments in Marine Propulsion." As a member of the commission to examine into the strength of the marbles offered for the extension of the Capitol at Washington he rendered valuable service, and discovered a method of largely increasing the resisting power of all kinds of building stones. Mr. Ewbank's mind retained its activity, and he was a frequent contributor to scientific journals up to the time of his death, though he was nearly 79 years old. The funeral took place on the 19th inst., from Mr. Ewbank's late residence, No. 14 East Thirty-first street. The Rev. Dr. Drown, of Brooklyn, read the services and pronounced a short eulogy. The interment took place in Greenwood Cemetery.

Underground Defenses of Paris.

The Paris correspondent of the *Daily News* writes: What think you of the enemy entering a modern city by its subterranean passages ways; and at a given signal, appearing above ground? The chance of the Prussians attempting this in Paris is actually being canvassed, and the few people who have been at pains to ascertain for themselves, and by nauseous personal experience, what the sewers of a well-drained capital are like, what it is to walk in them and to follow their course, will admit the possibility of a vast force finding its way below ground to any portion of the city. For example, every street in the city of London has its hidden counterpart below. The sewer map of the engineer to our report on, M lay-ward, is as complete in its general outline as a map of the city itself, and beneath all the larger thoroughfares men can walk erect, and in many of them three or four abreast. The subterranean works of Paris are more wonderful still, and are admitted to surpass those of ancient Rome. From the suburb of Asnières to the Place de la Concorde an enormous subway runs, which is sixteen feet and a half high, eighteen feet broad, and more than three miles long. Besides this are below the city three spacious galleries running on each side of the Seine, the whole being provided with air-traps at regular intervals, and lighted with oil lamps. Descend into either of these, and you find them to be well built, and with facilities for cleansing them which are extremely suggestive of their value for strategical purposes. The subterranean drains or galleries, are furnished with iron tramways, along which small carts run, which are pushed by three men and furnished with a drop-plank, which fits exactly into the drain, and pushes the mud before it as it advances. On the turbid waters of the great collector, between Asnières and the Place de la Concorde, a good sized boat is navigated, and the wildest stories are abroad respecting its possible uses to the enemy. Most of these may be dismissed as idle, but I am in a position to affirm that a careful inspection of these subterranean works has been made, and that Paris is preparing itself, down even to the waters under the earth, for the possible reception of its foe. If gunpowder will blow up iron traps, water will spoil gunpowder, and the sanitary rite known as flushing the sewers would effectually dispose of an intruding force. The catacombs, again, into which seventy different staircases lead, and which extend not merely under the Faubourgs St. Germain, St. Jacques, and St. Marcel, but under such important buildings as the Palace of the Luxemburg and the Pantheon, have had more attention paid them within the last two days than has been the case for years. Their uses under contingencies, which it is inexpedient to name, their size and value as repositories, are all canvassed eagerly, and nothing shows more plainly the anticipations of the people of Paris than the keen interest they display in such topics as these.

A Valuable Indorsement.

The New Jersey *Journal*, published at Elizabeth, is now in its ninety-third year. In a recent issue it says: "Inventors and patentees are invited by Messrs. Munn & Co., to call at the SCIENTIFIC AMERICAN office, No. 37 Park Row, New York, and obtain, *free of charge*, a pamphlet of 108 pages of useful information, with law of patents, how to proceed, etc. To recommend these gentlemen, at this late day (as procurers of patents), to the inventors of New Jersey, would amount almost to a reflection upon the intelligence of the latter, seeing that it is scarcely possible that *any* individual possessed of the *mind* enabling him to *originate* a useful discovery, *could* have remained ignorant up to the present time of the existence of a firm so widely celebrated as that of Messrs. M. & Co. It is no exaggeration, indeed, to say that, after nearly 25 years' experience in procuring patents—an experience supported, too, by abilities of the first order on the part of the members of this highly-respected firm, the latter have a just claim to be considered at once pre-eminent and unequaled in their vocation as procurers of patents, a fact which inventors desirous of securing the same should not lose sight of."

The New York Evening Mail.

We are right glad to learn from our friend Major J. M. Bundy, the editor of the New York *Evening Mail*, that that spirited and excellent paper is meeting with the success it deserves. Its circulation has increased very largely within the last six months. The editor now offers to prove that it exceeds in this respect any other two-cent paper published in the city. Large as is the circulation Major Bundy informs us the sale of thousands of copies has been lost daily for want of facilities to print enough to meet the demand in time for the supply of certain localities. New and extended facilities have, however, now been provided, and a large increase of sales is confidently expected. The *Evening Mail* is one of the best of our dailies, and doubtless its future success will equal the most sanguine expectations of its accomplished, gentlemanly, and scholarly editor.

THE Lavoisier medal has been granted this year to M. H. Sainte-Claire Deville, for the great number of useful researches made by him in chemistry, and the applications these researches have received in practice. Among the subjects enumerated are: Researches on platinum; the industrial value of sodium; the discovery of the hydraulicity of magnesia; the researches on the application of dead and other heavy hydro-carbon oils as fuel for steam boilers; the dissociation of bodies by heat.

A LEGISLATIVE BLUNDER.—It appears that the bill revising the patent and copyright law enacted July 8, 1870, by a singular blunder repeals the acts of March 3, 1849, that provide for the establishment of the Department of the Interior. According to this state of things Secretary Cox is not now a member of the Cabinet. Although a blunder appears to have been committed the act is now treated as a dead letter.

THE highest mine in the world is the silver mine of Potosi, in the Andes of Peru, which is stated as being 11,367 feet above the level of the sea; and the deepest mine is the salt mine of Neusalzwerk (Westphalia) which is said to be 2,050 feet below the sea.

THE Panama and West India Telegraph cable was opened for public business to Jamaica on September 10.

Machine for Decorticating and Drying Grain.

This machine consists in an arrangement within a hollow cylinder of another hollow cylinder having on its exterior surface a corrugated spiral blade for rubbing the grain, within which interior cylinder is still another cylinder also provided with a corrugated spiral blade for rubbing and acting upon the grain which is conveyed to it, while either steam, or hot or cold air is admitted through the axle or shaft of the inner screw flange or propeller.

The grain is put into the hopper in batches, passed through the outer cylinder, and retained in the decorticator a longer or shorter time, according to the kind operated upon.

In combination with this portion of the device there is also an air-tight receptacle into which a batch of grain being put, the hulls are loosened by first extracting the air with an air pump and then admitting the air suddenly, repeating the process as many times as is requisite to partially detach the hulls.

A heater and a fan blower are also employed to force heated air into the decorticating cylinders.

Fig. 1 is a top view of the apparatus, and Fig. 2 is a section through the principal cylinder, showing the positions and operation of the corrugated spiral blades and the cylinders upon which they are formed.

A, Figs. 1 and 2, is the external cylinder containing the cylinder, B, Fig. 2, which also incloses the cylinder, C. The two latter cylinders carry the corrugated spiral flanges above mentioned. The cylinder, C, is made hollow. The cylinder, B, has openings through its side at the ends at D and E, through one of which, E, the grain passes into its interior from the space between the cylinders, A and B, as it revolves, the passage being compelled by a scraper attached at the aperture, E.

The hollow cylinder, C, is a continuation of the pulley shaft, though made larger than the bearings, as shown. Its spiral blade acts to force the grain along to the opening, D, when it is again passed back into the space between A and B by a scraper. The grain thus makes the circuit over and over again through the spaces between the cylinders, being acted upon by the corrugated screw blades and a corrugated disk, F, Fig. 2, which by their friction decorticate it. When the grain is sufficiently operated upon it is withdrawn through a chute and passed over a screen or sieve, G, Figs. 1 and 2.

During the decorticating process a stream of heated air from the furnace and fan blower, I, is passed into the hollow shaft or cylinder, C, and issues through apertures made in its sides. This stream of air passing through the grain takes up the dust caused by the decortication of the grain, and passing it through a chute, H, at the top of one end of the cylinder, A, keeps the grain cleaned, and dries it when necessary.

The chute, H, is so constructed that if any grain be carried along by the blast it drops before issuing from the chute, and is carried back into the machine. Cold air and steam are also employed, according to the nature of the grain; steam being admitted to the cylinder, C, from a pipe through a stuffing box provided for that purpose.

Belts from the drum, J, are so arranged that they turn the cylinders in opposite directions.

K is an air chamber into which batches of grain are put, and the air being exhausted therefrom by the air pump, N, the air is allowed to rush in violently a number of times to detach partially the hulls or husks of the grain, after which the grain is let out into a receptacle at the bottom, from whence it is carried up to the conveyer, L, which passes it along to the elevator, M, which throws it into the hopper from which it passes into A for the subsequent decorticating process. The violent action of the air on grain in the air chamber, K, is intended to detach partially the hulls from the grain and to render the subsequent process more rapid. The progress of the operation is determined by taking small samples from the discharge chute.

Steam is employed for decorticating peas, beans, and corn intended for hominy.

When rice is dressed it is also passed through a revolving screen and burnisher. The machine is intended to also prepare coffee, and all other grains not mentioned in the above description, usually subjected to such a process.

The apparatus is simple, compact, cheaply made, and durable. Acting by frictional contact it does not, it is claimed, cut, break, or grind the grains.

The patentee of this machine took the three first premiums at the Louisiana State Fair last year on the following machines; namely, rice huller, burnishing and finishing device, and hominy mill.

In a letter of the 1st ult. to this office, he says: "Yesterday, through your Agency, I received a patent for my machine for decorticating and drying grain, etc., which is the sixth patent issued to me through your house since 1857. The business capacity, energy, and fidelity you have evinced in all my transactions with you should entitle your establishment to the fullest confidence of all persons interested in the procuring of patents."

Patented, August 23, 1870, through the Scientific American Patent Agency, to Evan Skelly, whom address for further information, at Plaquemine, Iberville parish, La.

Fig 1

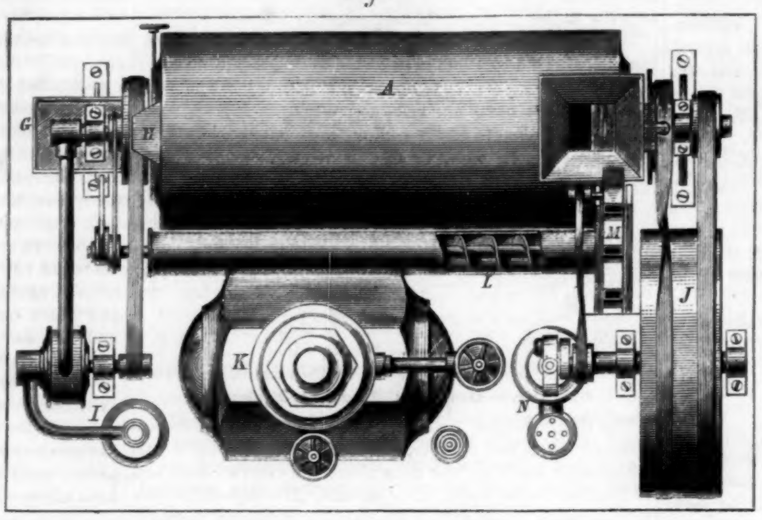
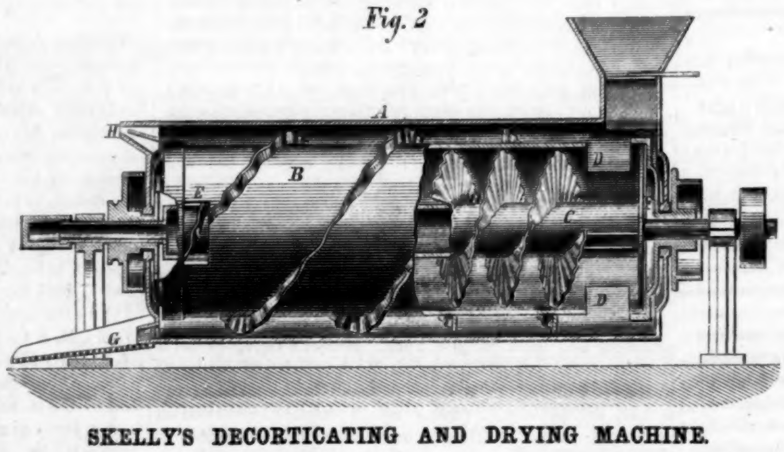


Fig. 2



SKELLY'S DECORTICATING AND DRYING MACHINE.

Dynamical Refrigerator.

A Frenchman, M. Tasseli, has invented a contrivance consisting mainly of a tube wound round a central axis, and movable in a trough partly filled with water, and not unlike the trough in use for grindstones. By the rapid motion of the tube through the water that fluid enters the tube; while the water which is outside of it evaporates rapidly, and, by that evaporation, causes the cooling of the water inside, which, by the developed centrifugal force, is carried through the windings of the tube, and thus affords means for obtaining a supply of comparatively cold water. The author stated that he has found by experiment that, even when the initial temperature of the water is 36° C., it may be cooled down to 18·5°; and when a ventilator is simultaneously used, so as to produce a strong current of air upon the convolutions of the tube, and thus accelerate the evaporation, the cooling effect is greatly increased. The speed to be given to the metallic tube is very moderate.

Fig 1 Fig 2 Fig 3

PILKINGTON'S FAMILY ICE PRESERVER.

Improved Family Ice Preserver.

The object of this improvement is to furnish for family use a neat, convenient, and portable apparatus for preserving ice in small quantities. The mode heretofore pursued has been to wrap the ice not needed for immediate use in a blanket or other woolen cloth, and then stow it away in a cool place until needed; the disadvantage of which process is that the blanket not being a perfect nonconductor even when dry, soon becomes wet by the melting of the ice, and in that condition it conveys away the heat rapidly, the result of which is, when ice is looked for only a wet blanket is found. The blanket, to be fit for use next day, is to be wrung and dried, and it is to save the trouble of wringing and drying and the disappointment of finding no ice when it is wanted that this simple little apparatus is offered. Fig. 1 is a view of the apparatus as it appears when closed and in use. It is a simple felt case of any convenient size for carrying, with a leather strap, E, over the top in the shape of a bail handle, which, extending down the sides, serves to bind together the case and its hood or cover. Fig. 2 is a sectional view, showing the construction, in which A is a tin or other water-tight vessel, with a close fitting lid, C.

This vessel is incased in a tightly fitting cover of felt, B, from half an inch to an inch in thickness, as shown in perspective in Fig. 3. D is a hood or cover of felt, half an inch or an inch thick on top, but not thicker than an ordinary felt hat on the sides. F is a narrow strap and buckle passing around the circumference, and intended to bind the hood tightly around the case so as to prevent the passage of air.

In practical operation the ice is washed, put into the vessel A, Fig. 3, the tight-fitting tin lid, C, Fig. 2, is then put on, and the hood, D, drawn over all, strapped down by strap, E, and hugged around by strap F, and the ice is secured in a vessel made as practically nonconducting as it can be with ordinary means. Whatever melting of the ice takes place is by this means all economized, because the clear, cold, ice water remains in the vessel fit for drinking, and is not lost in the blanket. There is no wet blanket to be cared for, and the apparatus is ready always for immediate use. Being compact and portable it is admirably designed for picnics, excursions, etc. A patent has been ordered to issue, and the inventor is desirous to communicate with manufacturers or others interested. Address Jas. E. Pilkington, Baltimore, Md.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of August, 1870:

During the month, 425 visits of inspection have been made, and 703 boilers examined, 636 externally and 180 internally, while 81 have been tested by hydraulic pressure. Number of defects in all discovered, 446; of which 45 were regarded as dangerous. Defects in detail were as follows:

Furnaces out of shape, 19—1 dangerous; fractures, 34—2 dangerous; burned plates, 33—3 dangerous; blistered plates, 37—1 dangerous; cases of sediment and deposit, 83—8 dangerous; cases of incrustation and scale, 62—8 dangerous; external corrosion, 24—4 dangerous; internal corrosion, 13—1 dangerous; internal grooving, 4; water gages out of order, 14—1 dangerous; blow-out apparatus out of order, 4; safety valves overloaded, 27—3 dangerous; pressure gages out of order, 61, varying from —8 to +4; boilers without gages, 4; cases of deficiency of water, 3—2 dangerous; broken braces and stays, 13—4 dangerous; boilers without gage cocks, 4; rip seams, 2—2 dangerous; boilers condemned as unsafe to use, 5.

The above record shows the importance of making frequent examinations of boilers. It will be seen in the record of explosions that in one case there was no steam gage on the boiler, and an extra weight had been placed on the safety valve lever—three men were killed and others wounded. This case alone shows the importance of having boilers and all their attachments in the most perfect condition. A boiler without steam gage and with safety valve overloaded, is a most dangerous thing to have in the vicinity of human beings, and a person who would allow a boiler to be used on his premises under such circumstances, exposing lives other than his own should be held guilty of criminal neglect.

There were nine explosions during the month, killing outright fourteen persons and maiming nineteen others. Whether these occurred from want of care, poor construction, or carelessness, we are unable to say, as we had never examined any of these boilers.

Cause of the Fires of Pine Forests.—A French scientist, F. Schrader, thinks that the cause of the very frequent fires of pine forests in summer time and remote from any habitation, is not due, as has been often surmised, to willful arson or accidental imprudence, but is produced by the action of the concentration of the sun's rays upon the hollow globules of resin which exude from the trees acting as burning lenses, and becoming inflamed, thus causing the combustion to begin, and, once begun, to spread rapidly, in consequence of the highly inflammable nature of the resinous and turpentine-containing wood.

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VOL. XXIII., No. 14 . . [NEW SERIES.] . . *Twenty-fifth Year*

NEW YORK, SATURDAY, OCTOBER 1, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums of the country.

NEW RELATIONS OF SILICA.

Something akin to a hoax was recently widely copied into the secular press that an Hungarian with a most unpronounceable name had discovered a new solvent for carbon and silex by which we should soon be able to manufacture diamonds and quartz crystals at pleasure. The story had its origin in the imperfect understanding of a really important discovery of new chemical relations of silica recently made in France.

Professor Friedel, of the School of Mines in Paris, and Professor Crafts, of the Cornell University, have for a long time devoted much attention to the organic compounds of silicium, and have published several valuable papers on the subject. They have combined silicon with the radical of the ethyle group, under the name of silicium ethyle, and also with iodine.

The iodide of silicium is prepared by passing a mixture of the vapor of iodine and carbonic acid over heated silicium. It is a highly volatile substance, and burns in the air the same as carbureted hydrogen; when mixed with oxygen it produces a highly explosive compound. Professor Friedel has also prepared a substitution compound called silicidioform, which is in fact a chloroform, in which carbon is replaced by silicium. These investigations have paved the way for the discovery of other organic compounds containing silicium, an account of which we find in a recent number of the *Comptes Rendus*. Professor Friedel, in conjunction with Ladenburg, has prepared several ethyle compounds, one of which they call *silicopropionic acid*. This acid is analogous to silicic acid, but is distinguished from it by its inflammability, as it burns like tinder when ignited. In this respect it resembles the hydrated oxide of silicium, discovered by Woehler, which glows when heated in the air, and changes into amorpous silica. The new acid is insoluble in water, but readily soluble in warm concentrated potash, the same as infusorial silica. It is a feeble acid, analogous to silicic acid, and is said by the discoverers to constitute one term of a series of homologous acids. It is, in fact, a carbureted silicic acid. This is the first discovery of a direct compound of carbon and silicium, and in its consequences is of great importance, as it affords a clue to the mystery of the assimilation by plants and infusoria of the silica of the soil.

The announcement of Friedel's paper in the Academy called out a communication from Paul Thenard, in which that chemist announces that the humic acid group, under certain modifications, has the power to dissolve silica. He does not describe the experiments fully by which he arrives at this result, but simply mentions that by a molecular combination of ammonia with the acids of the humous series he produces the new compounds that have the power of dissolving silica.

He has succeeded in forming four distinct acids of the humic acid type, which, as they contain nitrogen, he calls *azo-humic*, or, as we should say in English, nitro-humic. These nitro-humic acids are remarkably permanent, and only give up their nitrogen at a high heat. They combine with silica to form new acids, *siliconitro-humic*, which combine with the alkalies, from which they may be again separated unchanged.

Thenard has traced these nitro-humic acids to soils, and concludes that the soluble silica of soils is to be attributed to this origin. The proportion of silicon taken up by the nitro-humic acids depends upon the amount of nitrogen present, and varies between 7·5 to 24 per cent. Here we would seem to have a new explanation of the value of ammonia and of nitrogen to soils in promoting the growth of vegetation, and also why muck and rotten wood add to the fertility of soils. Professor Henry Wurtz, the accomplished editor of the *Gas Light Journal*, in commenting upon the importance of these discoveries of the chemical relations of silica, very properly ascribes great value to them. He says that they afford at once "a theory, not only of new relations of plant decay to plant nutrition, but also of the far broader subject of the transformation and migration of silica throughout all past geological ages, and of the continued and (as the writer believes) *sole* agency of life in these, as in the past and present migrations and transformations of carbon."

The diamond has long been looked upon as being of organic origin, and these new researches may throw some light on the subject. Solvents for carbon and silica are of great interest, and we may eventually by means of them be able to crystallize diamonds and quartz through their instrumentality, but such an application of the discovery would be insignificant in comparison with the probable solution of the far more important questions of the growth and decay of plants, and the origin of silica in rocks and soils. We shall therefore follow with great interest the subsequent researches of Friedel, Crafts, and Thenard on this subject.

HISTORY AND PROGRESS OF PHOTOGRAPHY.

Dr. H. Vogel, whose recent visit to this country will be remembered with so much pleasure by every one who had the good fortune to meet him, has sent us his treatise on photography (Lehrbuch der Photographie) in a royal octavo volume of 500 pages, from which we propose to extract some of the leading facts in reference to the history and progress of this science.

Although the art and science of photography has only existed twenty-five years, yet it is safe to say that in no other department of investigation has there been greater progress than in this. At first it was confined to taking portraits, and was looked upon as a trade rather than as a science; now its applications extend into every branch of human knowledge; it gives to the naturalist true pictures of animals, plants, and minerals, and to the geographer, plans for charts; by it the engineer in a few minutes can make true copies of the most difficult drawings, for the preparation of which the most skillful draftsman would require many weeks. In lithography and porcelain painting there is now extensive application of photography. The finest productions of artists are copied and easily multiplied, so as to be accessible to the poorest man, and in this way photography serves to cultivate the tastes of the people for art, just as printing disseminates a knowledge of science. There are few branches of science into which photography has not penetrated, and where its services have not been of the most signal importance.

The first attempt to take a picture by chemical means appears to have been in 1802 when Wedgewood and Davy immersed a piece of paper in a silver bath, and afterwards exposed it with a silhouette to the action of the light. A copy of the silhouette was thus obtained, but the picture was transitory, as the portions that had remained white gradually became dark in consequence of the silver salt still remaining in the paper, and thus the same agency that made the picture afterwards destroyed it.

About the same time with Davy's researches Niépce in France was attempting to take pictures with other agents than silver. He made use of a solution of asphalt in lavender oil. He sensitized a plate with this solution and exposed it for hours in a camera. All the portions acted on by light were thus rendered insoluble, so that when the plate was worked in ethereal oil the picture became visible. Niépce as early as 1826 made pictures in this way, called heliographs, but the operation was too long and tedious to be of any practical value.

In 1829 Niépce entered into association with Daguerre, who had for some time been devoting himself to similar researches, and the two worked together for the accomplishment of the great result; but Niépce died in 1833, without witnessing the realization of his dreams. Daguerre continued the work undiscouraged by failure, undismayed by the skepticism of others, until, in 1838, he presented to three members of the French Institute—Humboldt, Biot, and Arago—permanent pictures taken by aid of light in an easy and practical manner. They created immense excitement. Everybody was anxious to become acquainted with the secret of their preparation.

Through the influence of Arago, Daguerre was induced to make known his process in return for a yearly pension of 6,000 francs, guaranteed to him by the government. At the same time a son of Niépce received a pension of 4,000 francs. The 19th of August, 1839, was appointed for making known the secret of the method at a meeting of the Academy of Sciences, and the rush for seats was tremendous. The hall was soon filled to suffocation, and large numbers crowded the courts and blocked the streets eager to catch the first news of the wonderful discovery. The story was soon told, and the printing press rapidly spread the intelligence to all parts of the world.

Daguerre attained his object in an entirely different way from Niépce and Wedgewood. He employed the iodide of silver as his sensitive agent, which he produced by the action of the vapor of iodine on plates of silver. The action of the light on such an iodized silver plate after exposure in the camera, is not visible to the naked eye until it has been subjected to the action of the vapor of mercury. This latter operation is the distinguishing characteristic of Daguerre's discovery. While other experimenters sought to obtain pictures at once visible by the direct action of the sunlight, he brought out invisible pictures by means of a secondary agent, now called the developer.

It is said, though not by Professor Vogel, that Daguerre found this developer by accident. Some old silver plates had been put away in a dark closet in which were numerous chemicals, and, among others, a bottle of mercury. On taking them out for renewed experiment, Daguerre, greatly to his astonishment, found that several of them showed distinct pictures. Here was the accomplishment of all that he had been striving to obtain; but what was the secret agent that had brought out the picture? The closet contained numerous chemicals, each of which had to be tried in turn, and when mercury was reached, and its vapors expelled beneath an exposed plate, the picture was developed, and the secret disclosed at the same time. We give the story for what it is worth, premising, however, that it is more probable that Daguerre aimed at a knowledge of the action of quicksilver by direct experiment, and not by accident. The new art was very properly named after the discoverer, daguerreotype.

At the same time with these discoveries in France, a wealthy Englishman, Fox Talbot, was occupied with attempts to make paper negatives, which he developed by means of gallic acid and some salt of silver. He published an account of his process in 1841, but the rough surface of the paper and the inferiority of the pictures to daguerreotypes left an unfavorable impression, and the method was soon forgotten. A nephew of Niépce, Niépce de St. Victor, recently deceased, substituted glass for paper, which he coated with sensitized albumen, and thus introduced glass negatives, and prepared the way for the use of collodion upon wet plates. Archer in England, published, in 1851, a full description of his collodion process, which soon took the place of all other methods, and is now the one almost universally employed.

The solubility of gun cotton in a mixture of ether and alcohol was first made known by Dr. Maynard, of Boston, and as soon as the fact was published collodion was suggested as the best solution for fastening a film upon glass. The collodion process gave us negatives, and Talbot's paper enabled us to copy them and fix them. Thus by degrees the art was developed until it reached its present high state of perfection. The great demand for cameras turned attention to that instrument, and very great improvement has been made in the construction of photographic lenses. Chemical agents of all kinds have been improved and purified, and are now manufactured on an immense scale. Some of these chemicals were formerly so rare that they could only be found in the cabinet of some university. Now they are manufactured by the ton, and their price has diminished more than a hundredfold. One of them, the hyposulphite of soda, is now suggested as a substitute for common washing soda in the laundry, so readily can it be obtained.

From small beginnings the art of taking pictures by the aid of light has become one of the most important of the many applications of science to the arts, and a work of 500 pages is now required to describe even superficially all that it is required to know on the subject. Professor Vogel has performed the task he has undertaken in the most creditable manner, and it is to be hoped that his book will be translated into English, so as to be available to American readers.

THE USE OF BALLOONS IN WARFARE.

"Find out what your adversary wants you to do and then don't do it" is a military maxim attributed, whether authentically or not, to the first Napoleon. But, besides finding out what your adversary wants you to do, it is of the first importance to find out just what *he* is doing and intending to do.

It is plain, therefore, that any means of penetrating the secrecy with which in war each party seeks to cover its movements is of incalculable value.

With this object the use of balloons for the purpose of reconnoissances was at one time thought to promise great results. The French, always among the first to utilize any discovery in science or the arts, in the latter part of the eighteenth century instituted a secret school of aerostation, with a view to the use of balloons in war, and it is stated that Napoleon had a balloon sent with his army in his Egyptian campaign, and also that the use of the balloon was of great value to the French under Gen. Jourdan in the campaign against the Austrians in 1794.

In the present war in Europe, balloons are again being employed, and it is quite possible they may prove of much service from the absence of the principal cause of their failure in our recent civil war.

Danger from long range guns, want of military and topographical knowledge on the part of the aeronauts, and the impracticability of operating balloons in cloudy, rainy, or foggy weather, were the causes of failure with us; the want of knowledge on the part of aeronauts being the worst of all. They neither know what to look for, nor recognized it when they saw it. With well trained men skillful in the practice of reconnoitering from an elevated position, and thoroughly versed in military affairs, as well as the topography of the country, the case might have been very different.

CANADIANS can now apply for patents in the United States upon the same terms as citizens. Full information can be obtained by applying to the publishers of the SCIENTIFIC AMERICAN.

FAIR OF THE AMERICAN INSTITUTE.

The close of the second week of this fair still finds the arrangements not complete, although they are sufficiently so to give a fair idea of what the exhibition will be. The display of fancy articles and the various articles of merchandise and manufacture usually exhibited is full, and as good as usual. The machinery department is not as full as heretofore, and it contains less of interest than this department exhibited last year. We shall endeavor to say something about the machinists' tools next week. The display of wood working machinery is not as full as it was last year. The falling off is doubtless due partly to the fact that the American Institute held no fair the year before last, and that there was last year an accumulation of inventions which those interested were anxious to exhibit, and also partly to the fact that the course of the menagement in the award of premiums on steam engines at the last exhibition was such as to shake public faith in the fairness of the awards. The

STEAM ENGINES

exhibited are few, but there are some good ones. A first-class horizontal engine, called the Allen engine, is exhibited by the Allen Engine Works, Fourth avenue, One-hundred-and thirtieth and One-hundred-thirty-first streets New York. The engine is employed to drive the machinery on exhibition, and is the most attractive object in the room where it stands. It is noticeable that it runs at an extraordinary speed for an engine of this size. It makes one hundred and thirty revolutions per minute. Yet so well is it constructed and so firmly set that it makes no jar. Indicator diagrams taken from this engine show that the exhaust and admission approximate very closely to perfection. The exhaust valves are upon the opposite side of the cylinder from the induction valves, and are operated independently by a rock shaft connected with the eccentric by means of a link. The link is attached directly to the band of the eccentric, and also operates another rock shaft, which drives the induction valves. The valves are plain slides, and are all balanced. They run with the greatest ease. The end of the connecting rod which operates the rock shaft, belonging to the induction valve gear, plays in the slot of the eccentric as it is operated upon by the governor, making a variable cut-off of great simplicity and efficiency. The governor is that known as "Porter's Governor," and is so well known to engineers that we need not describe it minutely. No one familiar with steam engines can inspect this engine without being convinced that as a specimen of good workmanship and engineering skill it can be equaled by few engines known to the American public.

Green, Trowbridge & Baldwin of 326 and 328 Delancy street, New York, show a very compact and evidently a very well constructed engine of 40-horse power. It is an inverted walking beam engine, so arranged that the crank and pitman balance the piston-rod and cross-head. A noticeable feature of this engine appeared in the Scientific American of February 27, 1869, to which the reader is referred for further particulars.

PORTABLE ENGINES.

There are the following: The Baxter Engine, exhibited by Russell & Speer, Newark, New Jersey, attracts much attention, and is undoubtedly worthy of it. A full description of this engine, with engravings, will be found on page 353, Vol. XX., of the Scientific American, to which the reader is referred.

The New York Safety Steam Power Company, No. 44 Cortlandt street, New York, exhibit a vertical portable engine, in which the slides and pillow-blocks are cast with the column, and the parts are duplicated by special machinery which permits of any part being replaced quickly and cheaply.

A Wood and Mann horizontal portable engine is exhibited by C. Edward Copeland of 42 Cortlandt street, New York. Our readers are so familiar with the features of this engine, of which there are great numbers in use in various parts of the country, that we need not enter upon details of its construction.

S. S. Zabriskie of Bergen Point, New Jersey, exhibits a portable engine, designed to be as cheap as possible, and free from complications, so as to be specially adapted to pumping and other agricultural operations. A novelty on this engine is the omission of the cross-head, the stuffing-box of the steam cylinder being made long to serve as a means for securing parallel motion in the piston-rod.

The Economy Steam Engine Company, 119 Liberty street, New York, exhibit a reaction and direct action rotary engine.

Edward P. Hampson of 38 Cortlandt street, New York, exhibits the Ames Agricultural Portable Engine, illustrated and described on page 311, last volume of the Scientific American.

Merrick & Sons, 430 Washington avenue, Philadelphia, Pa., exhibit an oscillating engine with D slide valves, intended to obviate the objections usually made to oscillators having a valve motion, depending for its efficiency on rubbing surfaces either flat or radial, with the center of motion of the cylinder, and which cannot be kept tight for any length of time. The machinery in the shops of the manufacturers in Philadelphia has been driven for a number of years by engines of this pattern.

The Rider Vertical Engine, exhibited by Handren & Ripley, was recently described and illustrated in our columns. It is a highly finished and very econom cal engine.

An Ericsson Caloric Pumping Engine is shown by J. A. Robinson, 130 Broadway, New York.

STEAM BOILERS.

There are but very few boilers on exhibition.

L. Phleger & Co., 142 South Third street, Philadelphia, Pa., exhibit a Steam Generator which consists of a combination of series of horizontal and inclined tubes, the furnaces being built of a series of tubes, which form the grate bar, afterward curving in a V-shape, to make the top or ceiling of the surface. Both ends of the tubes in this series are fitted and secured respectively into tube sheets, connected with a series of horizontal tubes, by means of cast iron semi-circular caps or water-ways. The ends of the tubes are incased by semi-circular water caps, properly secured by flanges and bolts to the tube sheets by means of bolts. Stand pipes are also placed on both sides of the tubes at the front end of the generator, and connect with them by means of openings leading to and covered by the caps or water-ways. It also has a steam drum of cast or wrought iron, intended to collect all water from the steam and deliver it in a dry state to the engine.

A boiler called Weigand's Safe Steam Generator, is employed to drive the Allen engine above described. We unfortunately did not obtain the address of the exhibiters. It is a tubular boiler, consisting of a series of vertical tubes, with inner tubes through which the cooler water descends, the hotter rising within the annular spaces between the pipes. The vertical pipes are connected with a horizontal series and a steam drum.

The New York Safety Steam Power Company, 44 Cortlandt street, New York, also exhibit a tubular boiler, constructed on a somewhat similar principle.

Among minor steam engineering devices we notice the American Eagle Steam Gage, exhibited by the American Eagle Steam Gage Co., 190 Market Street, Newark, N. J., which is undoubtedly a good one, belonging to the type known as mercurial gages. It consists of a cast-iron chamber fitted to receive a thin corrugated steel diaphragm or disk, properly tempered, and plated with nickel, to prevent corrosion. The pressure acts upon the under side of it, the mercury covering the top side of the same, from which extends an open vertical glass tube, supported and protected by a metal case, having a graduated scale of pressure. Any slight movement of the disk will fill the tube with the mercury to a greater or less degree, whereby the pressure is correctly indicated. There is a screw by which the starting point of the mercury can be readily adjusted, so that whatever the temperature of the surrounding atmosphere may be, the indication of the pressure will be correctly indicated. The latter feature is a very important and valuable one, and combined as it is with the absence of wheels, levers, clock-work, or gearing of any kind, renders this gage worthy the attention of such visitors to the fair as are interested in such improvements.

A recording pressure gage is shown by Charles G. Willing, of 88 John Street, New York, which gives a continuous and exact record of the pressure, and the time at which the pressure was sustained, automatically. The principle of recording is the tracing on a rotating disk of a pencil point in the end of the index hand.

W. H. Place, 8 Attorney Street, New York, exhibits an improved governor and valve, of novel construction, and apparently of great effectiveness. The exhibitor offers a $500 challenge to any who wish to compete with it. Mr. Place, the inventor, was formerly Chief Engineer of the Central American Transit Company. His invention consists of a vertical cylinder or case, in which are placed and attached thereto a series of inclined or spiral formed ribs, within which revolves (in water or other liquid), a propellor wheel, revolving and leading in an opposite direction from said spiral ribs in said cylinder, making the shaft, by passing through a series of friction rolls attached to the throttle valve, check or increase the motion of the engine, the stem of the shaft of the propeller wheel passing through friction rolls without packing, causing instantaneous and sensitive motion to depress or elevate the throttle valve. The governor is operated from the main shaft by means of a belt and pulleys.

Berryman's Automatic Boiler Feed Regulator and Electric Low Water Alarm, is attached to one of the principal boilers at the fair. It is an ingenious device, but as it is shortly to be illustrated and described in these columns, we will not anticipate our description. It is exhibited by the Berryman Regulator and Alarm Company, Hartford, Conn.

SCALES, SAFES, AND LOCKS.

There are a few things worthy of notice in this department of the exhibition.

Herring, Farrel & Sherman exhibit a new style of burglar-proof safe, made of Franklinite, or *spiegeleisen*, combined with welded steel and iron. It is cylindrical, and the top is raised to open the safe or lowered to close it by a very strong vertical screw in the center of the cylinder. As the top is raised, the wood work, containing drawers and pigeon-holes, also is raised, so as to become accessible. A combination lock fastens the top when closed, so that it is held in a very secure manner. This safe appears to be a very difficult thing for burglars to deal with, and we judge will not often be attempted by that ingenious fraternity. A desk safe, also of new style, exhibited by the same firm, is worthy of notice.

An application of electricity to bank locks, exhibited by the Electro-Bank Lock Company, No. 9 Willoughby street, Brooklyn, is a most ingenious affair. A combination lock is worked entirely by electro-magnetism, and is placed within the safe on the *back wall*, opposite the door. Its wheels are worked by electro-magnetism, the circuit being controlled entirely by circuit-breakers placed in an office desk or any other convenient place. No one can unlock the safe without knowing the combination, and no key-hole or any other aperture in the walls of the safe exists whereby powder can be inserted. Burglars could only enter a safe provided with this lock by actually penetrating the wall. The lock itself is absolutely exempt from all tampering.

Ellison & Co. of 3 Park Place, exhibit a fine line of platform, railroad, and hay scales, counter scales, and balances Similar exhibitions are made by Wm. R. Cock, 85 Liberty street, New York agent for Riehle Brothers, Philadelphia.

MINOR MACHINISTS' TOOLS, ETC.

Among the minor machinists' tools and similar articles on exhibition, we notice a fine case of twist drills and chucks, exhibited by Geo. Place & Co., 126 and 128 Chambers street, New York.

Post & Goddard, 109 Liberty street, New York, exhibit a beautiful line of twist drills, taps, dies, reamers, etc., a very large variety, and admirably arranged for inspection.

The Baxter Screw Wrench Company exhibited a fine line of their adjustable S wrenches, one of the most ingenious, simple, and useful wrenches in market. An illustrated description of this wrench appeared on page 116, Vol. XX., of the Scientific American.

The Centerbrook Manufacturing Company exhibit a fine assortment of augers and bits; a good variety and of excellent finish.

A novelty in the display of minor tools is Jones' Patent Joint and Miter Planer, a hand tool whereby a perfect right-angled or miter joint may be made, or a piece be planed square or to any required angle, with ease and accuracy, even by the inexpert. This is accomplished by an adjustable table, upon which the piece is laid, and brought up to the cutting iron of the plane, at the angle desired. The plane proper runs on ways, and thus has a perfectly parallel motion.

[Special Correspondence of the Scientific American].

RESOURCES OF THE SOUTH--NOTES OF A TRIP FROM NEW YORK TO WESTERN TEXAS.

Memphis, Tenn., Sept., 1870.

Southern Air Line—West Virginia and East Tennessee—Chattanooga—Northern Alabama—Memphis River Steamers—Cotton-Seed Oil Works, Broom Factories, etc.—Future of the City.

We arrived here by what is called the Great Southern Air Line. As a freight route it has no superior, for we are told that in the season they carry a bale of cotton from Memphis to New York for $5. As a passenger route it is at present a failure, for there are no less than five changes of cars.

We struck the line of this route proper at Lynchburgh,—it really commencing at Norfolk, where it connects with steamers and sail to New York. We thus allude to it because it is an illustration of new ideas in the South, and one of the main types of the great progress that section has made since the war. Favors of any kind they have not bestowed, nor have we asked them.

On the cars we spoke of the great energy of Gen. Mahone. A gentleman remarked, "He is the best hated man in Virginia."

"Why so?"

"Well, he sold himself out to the Northern men."

In conversation with another we mentioned this, and he said, "Sir, Mahone is hated simply because he isn't an old fogy. This railroad was about played out; we didn't have the money to re-build; and what chance was there for a man of life and spirit but to get money from the North?"

The route commences at Norfolk, is under Gen. Mahone to Bristol, then is consolidated to Chattanooga, thence via M. & C. R. R. to Memphis and to New Orleans, via Mississippi Central, etc. Cars loaded with freight run through without change, as the whole line is five-foot gage. A new road is now building from Chattanooga to New Orleans, and the Selma, Rome, and Dalton line is also being extended. A glance of the map will show with these latter two lines a perfect air line from New York to New Orleans.

Southwest Virginia is a grass country. We met on the cars drovers going out there for cattle for the markets of Baltimore, Philadelphia, and New York. Good beef cattle are worth there $40 to $50 per head; veal calves, $25 to $30. The grass is similar to the blue grass of Kentucky. It grows almost spontaneously. The valleys produce corn and wheat in abundance. The rock formation of the country is limestone. The metallic ores are iron, zinc, copper, and lead. The lead mines near Wytheville supplied fully one half of that used by the late Confederate Government. Salt and bituminous coal are also found in greatest abundance. It is an immensely rich county therefore in all the great resources, but can hardly be said to be improved. Land is worth from $1 to $20 per acre, according to the amount of valley or bottom land which goes with it. There is a good sized iron works near Wytheville, but as time did not permit of a visit, we can give no statistics.

East Tennessee is also a country underlaid by limestone rock, full of ores of iron, etc. We saw everywhere along the route thriving fields of timothy—an article hardly known ten years ago.

We have as yet seen no section of the South which has improved so much since the war. Mowers, reapers, subsoil plows, and every variety of labor-saving machinery has been introduced. One merchant told us that he had sold 250 dozen apple-parers. We must confess that this great improvement surprised us. Ten years ago it had the same resources; today they are being developed and utilized.

All along the western slope of the Smoky Mountains exist immense beds of iron ore. These are being developed. Previous to the war they were worked to some extent, but not in a systematic manner. Northern capital has come in and bought up the sites of former works, improved them, or erected new ones. There are now five furnaces running in East Tennessee, which have a capacity of twenty-five tuns of pig iron per day. All but one run on charcoal, that one uses coke and raw coal. The ore used by is brown hematite

the Tennessee dye-stone ore, and one uses a species of franklinite.

Bituminous coal is abundant in the north and west, but a few miles from Knoxville. At that place is a flourishing and well-conducted rolling mill, which turns out about ten tuns of merchant iron per day. One of the owners of a furnace near Jonesboro told me he made 4 tuns of pig iron day, and sold it at the railroad depot at $45 per tun. From his figures he made his iron cost him a fraction less than $20 per tun. He owns sixty thousand acres of wooded land, for which he paid $1 per acre. The immense forests yet in their primval growth so near these valuable deposits of ore must make the production of charcoal iron one of the great industries of East Tennessee. Labor is cheap, and the fertile soil yields bountifully of the various grains and grasses.

Chattanooga is a small place, but delightfully located in a valley on the Tennessee River. It is a great railroad center. The surrounding scenery is beautiful, and for industrial purposes, there exist practically inexhaustible supplies of coal, iron, and limestone. The small rolling mill which existed here before the war has been elarged, and a new one for railroad bars is to be erected. East on the borders of North Carolina are the Ducktown Copper mines, now yielding largely, but we could not get any statistics.

On the railroad from Knoxville we saw a very neat cotton factory driven by water power, which we were informed was paying large profits.

Memphis has grown more than any Southern city, except Atlanta, and shows more signs of life now. It is favorably located, and has enterprising citizens. A railroad is rapidly being built to Little Rock, Ark., thence it goes to Shreveport, where it is to connect with the Texas Central, and also from Little Rock sends out an arm to El Paso. This city is now more the attraction of Northern capitalists than any other, and is destined to be *the* great city of the South. Located on high ground it can be perfectly drained, which New Orleans never can be. It is the keyhold of the great Southwest. Everything about it is life and vigor. New stores and factories are being erected which would do credit to Broadway in New York. Its manufacturing interests, too, are now large, and rapidly increasing. The culture of broom corn having become a staple in the South, we find here two flourishing broom factories.

The manufacture of cotton-seed oil has been of great importance, and is increasing. There are now three factories, and one more of large size building. Northern capital furnishes at least the initiatory of all these. Before the war but two existed, which manufactured about 3,000 tuns of cake and 120,000 gallons of oil. The Panola Co. made last year over 2,500 tuns of cake and 100,000 gallons of oil; the Memphis Co. about the same, and the smaller concern about half as much.

The new concern of Baldwin, Fenton & Co. are putting in presses to manufacture 5,000 tuns of cake and a proportionate quantity of oil per year. Then, too, except the two small concerns in Memphis, one in New Orleans, and one in Providence, there were no others in the United States, now there are at least twelve others in the South alone. The planter gets from $8 to $12 per tun for his seed. The cake was formerly shipped to Europe, but its great value as a fertilizer having been demonstrated, and the small price realized from shipment abroad, several of the companies have in themselves or through others, effected arrangements to put it before the people here as a fertilizer.

The Panola Co. mix cotton seed meal, sulphate of lime, salt, and the ashes of the hulls. These latter contain much more potash than wood ashes. All the companies claim to have made no money last year, which may be so, but we can hardly conceive such a result unless by carelessness or bad management.

I shall not here enter into the details of the business; but having looked into it in other places, may at a future time give you the results of my observations on this new and great industry of the South. Now for the swamps of Louisiana.

H. E. C.

NEW MECHANICAL MOVEMENTS.

On page 71, current volume, we offered four mechanical problems for solution, to which we have received a large number of solutions and attempts at solutions. All the problems have received correct solutions at the hands of some who have attempted them, but many have failed in their attempts, some by not observing the conditions of the problems, while others have produced devices that will not work at all.

We shall give a recapitulation of the problems, and the correct solutions that have been sent us.

PROBLEM 1.

It is required to produce continuously, in one direction, four revolutions in one shaft, to every one of the shaft from which it originally derives its motion, without the intervention of belts, or any rotating device between the two shafts, such as gears, pinions, or pulleys, although the shafts may themselves have upon them pulleys or other rotary device, but they must not be placed in contact or connected by belts.

PROBLEM 2.

Required to produce continuous rotation in one shaft from the rotation of a second shaft, the shafts to revolve in opposite directions, without the use of endless belts, toothed wheels, or friction gearing, pitmans, rocking levers, cams, or fly-wheels, and the shafts to be separated to any reasonable required distance.

PROBLEM 3.

Required to drive one shaft by means of a belt and pulleys, the power to be received from another shaft lying in the same plane, but not parallel to the first, the inclination of the second shaft to the first to be forty degrees, if necessary, and no intermediate friction pulleys or idlers to be used, that is, the belt must run straight, without any intermediate device, from the pulley on the driving shaft to that on the driver.

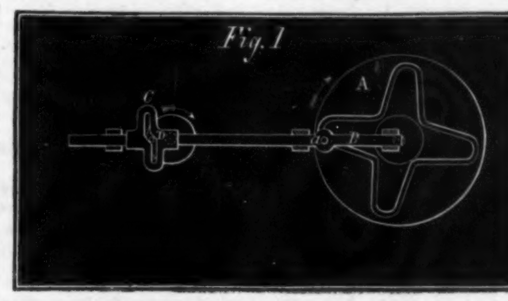
PROBLEM 4.

Required, by means of a *belt alone*, to not only transmit rotary motion from one pulley to another pulley, but to impart to the shaft of the driven pulley a longitudinal motion, the same as would be given to it by a screw thread cut upon it, but without the use of a screw or cam groove on the shaft, which shall be simply a plain shaft, of the ordinary kind, running without shoulders in plain bearings, and the pulley to be also a plain pulley of the ordinary kind keyed to the shaft.

Mr. J. Atkins, of Augusta, Me., sends the folloing solutions of the first two;

PROBLEM 1. NO. 1.

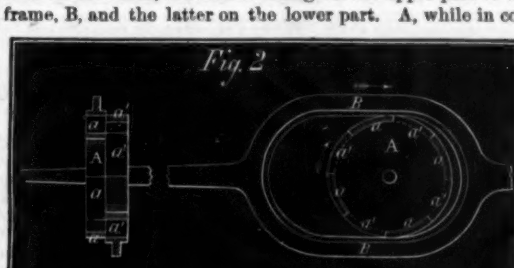
The cam groove in the driving wheel, A, Fig. 1, receives the pin, *a*, and, through it, drives the rod, B, and link, C, which latter revolves the crank pin, D, and its shaft four times to each revolution of A and its shaft, as required. The link, C,



for converting reciprocating into rotary motion I remember having seen in the SCIENTIFIC AMERICAN a year or two ago. Of course, the throw of the link must exceed that of pin, D, to the extent of the former's offset.

PROBLEM 1. No. 2.

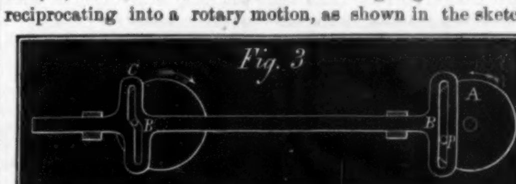
Attached to the face of the driving pulley, A, Fig. 2, are eight segments, *a a a a* and *a'a' a' a'*, each of which extends half the length of A, and one-eighth its circumference. These are alternated around the pulley, a a a a on one end, and *a' a' a' a'* on the other, the former acting on the upper part of the frame, B, and the latter on the lower part. A, while in con-



tact with B, carries it in the direction of the arrow, and, at the moment that contact ceases, *a'*, on the opposite side of the pulley, commences to carry B in the opposite direction, and so on to the end of the chapter. One revolution of A gives four entire reciprocations of B, which are converted into revolutions of D by the same device as in No. 1.

PROBLEM 2.

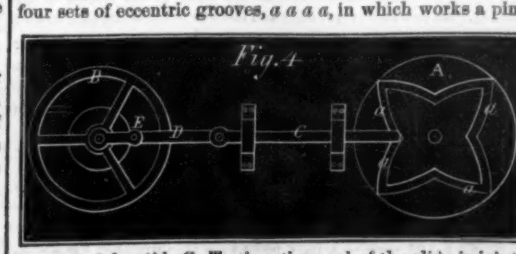
The crank pin, P, in the driving shaft, A, Fig. 3, carries the link, B, and the same device as in the foregoing converts the reciprocating into a rotary motion, as shown in the sketch.



To make both shafts revolve in the same direction, simply invert the link, C, while both shafts and crank pins remain in the positions shown in the sketch.

Mr. A. Roberts, of St. Catharines, C. W., gives the following solution for Problem 1. The same solution has also been given by C. H. Palmer, of New York city, Courtney Heath, of Toledo, Ohio, Wm. C Grimes, of Decatur, Ill., Wilber H. Conders, of Cleveland, Ohio, and George Koch, of Cass, Pa.

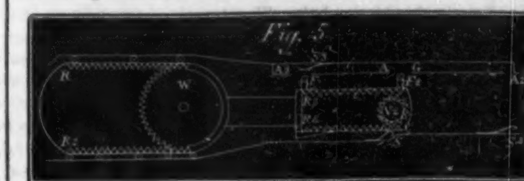
A, Fig. 4, is a circular disk placed on the driving shaft with four sets of eccentric grooves, *a a a a*, in which works a pin in



the end of the slide, C. To the other end of the slide is jointed the pitman, D, which engages with the crank pin, E, on the driven shaft.

Charles T. Moore, of White Sulphur Springs, Va., sends the following solution for Problem 1:

W, Fig. 5, represents the driving shaft, and W2 the shaft to be driven. One half the circumference of the wheel, W, is toothed as represented, and the other half left smooth, so one half a revolution of the wheel, W, will throw the rack, R, forward, and rack, R3, will turn the shaft, W2, twice, and in its forward movement will depress the springs, S and S2, at the same time bringing the friction rollers, F and F2, opposite the apertures, A and A2, at which point the springs, S



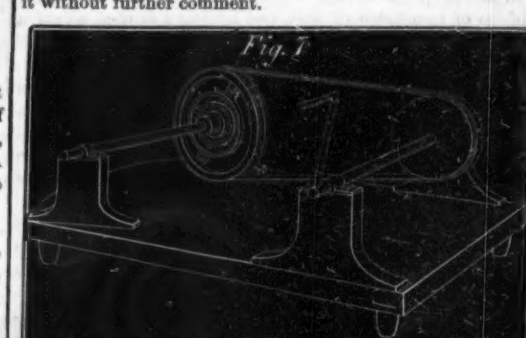
and S2, rise, placing the friction rollers, F and F2, above, and in the slot, G, disengaging the rack, R3, from the top of the wheel, W2, and engaging rack, R4, with the under portion of the wheel, so the other half revolution of wheel, W, will throw the rack back and cause two more revolutions of wheel, W2, which will bring the friction rollers, F and F2, to the apertures, A and A3, when the front will fall of its own weight, the back being assisted by spring, S3, when the operation may be repeated as before.

The same correspondent also solves Problem 2 by a water or air connection between the shafts, put in operation by water. The end of the driving shaft, Fig. 6, is placed in the cylinder, C, eccentrically, and fitted with a piston which will be forced backward and forward by the inclined wall of the

cylinder, C. C2 is *fac-simile* of C, and by crossing the pipes, P and P2, and revolving the shaft, S, the water will be withdrawn from one side of C2 and forced in on the other, thus causing it to revolve in an opposite direction. Air may be used instead of water.

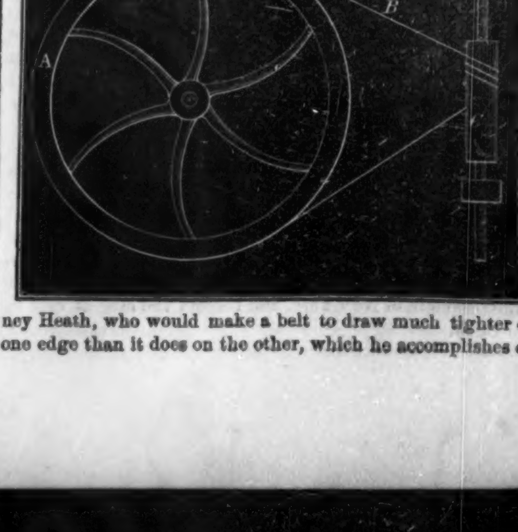
B. B. Stuart, of New York, solves this problem in the same manner, and also extends it to the solution of Problem 1, by making one rotary pump larger than the other. Still another solution to Problem 1 is, to connect the multiplying link movement invented by Courtney Heath, and illustrated on page 401, Vol. XXII., by means of pitmans and cranks to the driving and driven shafts. This solution is concurred in by C. Heath, of Toledo, Ohio, Wm. C. Grimes, of Decatur, Ill., John W. Grill, of Ind., James Carleton, of Cold Water, Mich., A. W. Johnson, of Lower Providence, Pa., and George Koch, of Cass, Pa.

Problem 2 is correctly solved by several correspondents, who would connect the two shafts by universal joints, but as this solution can not be said to be original, or new, we pass it without further comment.



Problem 3 is solved by a model sent us by Luke Chapman, of Collinsville, Conn., and by drawings, to the same effect, from A. Robertson, of St. Catharines, C. W., Geo. Koch, of Cass, Pa., Ira Bucklin, of Lebanon, N. H., J. W. Harkness, of Keeseville, N. Y., Jas. Carleton, of Coldwater, Mich., Wm. Trowbridge, of New Orleans, La., P. Porter, of Newark, N. J., E. S. Wicklin, of Irving, Kansas, H. Fuller, Masonville, Iowa, C. H. Palmer, of New York city, C. Grimes, of Decatur, Ill., Courtney Heath, of Toledo, Ohio, and T. H. Luders, Olney, Ill., and J. Atkins, of Augusta, Me. One pulley is attached to its shaft by a universal joint, Fig. 7. The model sent us works perfectly. Guide wheels or springs, to keep the jointed pulley in line with the other, suggested by some of our correspondents are unnecessary.

Problem 4 has received only two solutions. One is by Court



ney Heath, who would make a belt to draw much tighter on one edge than it does on the other, which he accomplishes on

a small scale by cutting the belt out of a plane piece of leather in the form of a ring. This causes the belt to travel on the pulleys, laterally, from one end to the other, in the direction of the slack side of the belt. The travel of the belt on the driving pulley may be prevented by a flange, or by placing the pulleys at a small angle with each other. A better solution is given by a Brooklyn correspondent, a top view of which is given in Fig. 8.

A is a horizontal driving pulley, grooved to carry the cord belt, B. This cord belt winds thrice about the driven pulley, C, as shown, the journals of the driven shaft being long, as shown, and without shoulders. When the pulley, A, revolves in the direction of the arrow, the driven shaft will regularly advance in the direction of D, and *vice versa*. This movement has been used with success on a light boring machine. The rate of longitudinal traverse depends wholly on the pitch of the belt coils.

SCIENTIFIC INTELLIGENCE.

TEST FOR WOOD FIBER

Mr. Voelter, an extension of whose valuable patent for the manufacture of wood pulp by mechanical means was recently obtained through this agency, exhibited to us a simple method for detecting the presence of wood fiber in paper or fabrics, which ought to be more generally known. The reagent employed is a weak aqueous solution of sulphate of aniline. If a drop of this liquid on a pointed glass rod be applied to paper, if wood be present, even in minute quantity, an intense yellow color will be immediately visible; but the test is only applicable when the wood pulp has been prepared in a mechanical way. Chemically prepared, wood does not yield the same reaction.

GAS MANUFACTURE IN NEW YORK.

The amount of gas manufactured in the city of New York during one month is something prodigious, involving a large consumption of fuel in the form of coke and of bituminous coal for the retorts. According to the *American Gas Light Journal* the following are the returns for the month of July 1870:

	Cubic feet.
Harlem Gas Light Co.	5,369,972
Metropolitan Gas Light Co.	15,565,432
New York Gas Light Co.	29,451,460
Manhattan Gas Light Co.	54,333,427
	104,720,291

We have no means of knowing what the average yield of gas is per tun, but as a poorer quality of coal is used in the summer time than in the winter season, it probably does not exceed six or seven thousand cubic feet, but even this yield involves the distillation of about 17,000 tuns a month, or over 200,000 tuns in a year.

SOLUBLE OXIDE OF IRON.

M. Liebert prepares this oxide by dissolving sugar in a cold solution of pernitrate of iron, and adding a diluted solution of ammonia and sugar. The clear liquid thus obtained is mixed with four or five times its volume of strong alcohol, and the separation thus determined of yellowish brown flakes, which are washed with alcohol. This precipitate, when dry, was found to contain 43·59 per cent of oxide of iron. It is a compound of sugar and iron, of a brown color, inodorous, tasteless, easily soluble in water, from which it is again precipitated by boiling.

Dissolved in water it does not give the usual reactions of iron with ferrocyanide or sulphocyanide of potassium; tannic acid causes a precipitate after some time, and sulphide of ammonium immediately decomposes it.

This oxide of iron is admirably adapted for medicinal purposes, as a sirup can be prepared from it, having a beautiful reddish-brown color, and without disagreeable taste.

The annual meeting of the Dental Convention was held in this city on the 20th inst. By invitation of the proprietors the members visited the dental warehouse of Mr. White to witness the workings of a pneumatic burr engine, an instrument which resembles an exaggerated pencil case, one end of which is crowned by a small box containing a wheel, which is put in motion by a current of air from a bellows beneath the operator's foot. This wheel imparts a rotary motion to the shaft contained in the tube. By means of this instrument the operations of boring the teeth, scraping, etc., are made more speedy. Files, polishers, and mallets may take the place of the burr attached to the shaft. The rapidity of revolution may be regulated by the operator, 1,500 revolutions per minute being the maximum limit.

The Brooklyn *Union* says: "The Scientific American is too well known to everybody interested in science and the mechanic arts to need much commendation at the hands of any one. Its columns for September 17 are filled with its usual array of matter, and will prove as interesting and instructive as the preceding numbers have been, during the many years of its usefulness. Every one at all interested in the objects to which it is devoted, knows its character, and we need only say that character is well sustained in the present number."

The new census shows Brooklyn to have 406,097 inhabitants. Ten years ago it numbered 266,714. It is now in population the third city in the Union, and its proportional growth much more rapid than New York. If the growth of Brooklyn continues to accelerate in the future, as it has during the past, it will not be many years before it will number more people than New York, and become the largest city in the Union

A sweater for New Yorkers is the tax levy for 1870 which amounts to *twenty-three million, nine hundred and seventy-two thousand, five hundred and fifty-six dollars.*

The State Fair of San Francisco, which closed on Saturday, September 17th, has been financially a success, the receipts being $30,000.

On Monday, September 19, the British Association for the Advancement of Science adjourned, after having elected Mr. Thomson chairman of the next meeting.

Gas companies are liable to a special tax under the revenue laws, according to a decision of the Acting Commissioner of Internal Revenue.

NEW BOOKS AND PUBLICATIONS.

The Hearth and Home,

A finely illustrated family journal of a high character, hitherto issued by Messrs. Pettengill, Bates & Co., has been purchased by Messrs. Orange Judd & Co., of 245 Broadway, New York, the well-known publishers of the *American Agriculturist*. The change will not at all affect the *American Agriculturist*, which will continue on independently as heretofore. The illustrations and reading matter of the two journals will be entirely different. Either of the journals will be furnished from now to the end of 1871 (fifteen months), at the yearly subscription rate, namely, the weekly *Hearth and Home*, at $3·00; the monthly *American Agriculturist*, $1·50; or the two for $4·00.

Wentworth's American Hardware and Metal Trades Directory

We call attention to the advertisement of this valuable work. It is very useful to those who wish to obtain the address of those engaged in those branches of industry.

Facts for the Ladies.

I have used a Wheeler & Wilson's Sewing Machine for thirteen years, constantly, in dressmaking, cloakmaking, light and heavy work. The machine has not rested one month during the time, and never had any repairs at all. I would not exchange it for any machine, and I have examined all.

Mrs. E. M. Barlow.

Zenia, Ohio.

Responsible Advertising Agencies

Are a great advantage to both Advertiser and Publisher. That of Geo. P. Rowell & Co., No. 40 Park Row, New York, is considered by many the most complete establishment of the kind in the United States.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.

All reference to back numbers should be by volume and page.

J. F., of Cal.—We find that the approved practice of engravers in transferring printed designs to wood blocks, is to employ a saturated solution of potash in alcohol. The paper is steeped in this for a longer or shorter period, varying with its character. No rule for the time can be given; experience can only guide in this particular. When taken from the solution the paper has a greasy appearance. It should now be washed in pure water until it loses this appearance. As soon as this takes place, it is placed on the block, and backed by several layers of bibulous paper. The whole is then pressed in a lithographer's press, which completes the operation.

W. A. M., of Pa., wishes a "dip" to give a fine copper color to hard brass.

W. F. H., of O.—See answer to H. H., of Mo., in this column.

A. McG., of Vt., is troubled with the fly wheel of the crank shaft in one of the old English upright sawmills. The saw has a two-foot stroke. The weight of the pitman and gate is balanced by a weight on the fly wheel placed opposite. It does not run steadily, and he wishes advice. He may learn something of balancing by perusing the correspondence on this subject now being published in our columns, but if some one who has had special experience in balancing saws would give his experience on this particular case, more than one might be benefited.

D. A., of N. Y.—If you desire to become a locomotive engineer on a railway, the best course for you to take is to enter a locomotive shop, and serve a regular apprenticeship as a machinist. Post yourself as much as possible on the theory of steam by reading, and a few trips with an engineer of experience would render you fit to take charge of a locomotive anywhere, provided you have the necessary ability, courage, and coolness in times of emergency.

G. W. B., of Mo.—We do not at present recollect a particular instance of the result of lightning striking a tin (tinned sheet iron?) roof, but an authority on the subject remarks that "edifices having flat terminations and a great quantity of metal insulated on the top, are often struck, and it is but seldom they escape without great damage." The Encyclopædia Britannica (Vol. VIII page 647) advises the metallic connection of every piece of metal on a roof with the conductor.

E. D. L., of ——.—We do not know whether the plastic slate has proved itself as good as was at first claimed for roofing purposes. There are many preparations for roofing; you must judge for yourself as to their merits. We do not think the paint on the metallic roof of your barn will continue long to contaminate the water in the cistern of the building. All new paint gives odor and taste to water at first.

G. G. H., of Ill.—The information you desire relative to varnishes and varnishing can be obtained in the "Painter, Gilder, and Varnisher's Companion," and "Riffault, Vergnand, and Toussaint's Treatise on the Manufacture of Varnishes," both published by Henry Carey Baird, 406 Walnut St., Philadelphia, Pa.

N. A. I., of Ind.—Your query can only be answered by experiment. We do not think the elevating power of any of the devices, except balloons, intended to navigate the air, has ever been actually determined, except in so far that it has been shown to be a minus quantity in a great majority of them.

W. B. V. V., of ——.—A lady asks in a late number for something to remove a musty scent and mold from heavy carpets. A few drops "oil pennyroyal" on the lining or under side will accomplish the desired end, and keep out moths and fleas.

H. H., of Mo.—To galvanize cast iron clean the surface thoroughly by the use of sulphuric acid, diluted with ten parts water, and a wire scratch brush. Then dip in a bath of melted zinc, having its surface covered with sal ammoniac.

E. J. M., of Cal.—The two applications of the toggle joint, of which you send diagrams, are capable of performing the same work; their mechanical power is exactly equal.

Business and Personal.

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Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 64 Nassau st., New York.

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See advertisement of New Work on "Soluble Glass," published by L.& J.W.Feuchtwanger, 55 Cedar st., N.Y. Price $3·20, mailed free.

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Builders—See A. J. Bicknell's advertisement on outside page.

For Sale—One half the interest in McGee's Patent Self-boring Faucet. Address T. Nugent, Morristown, N. J.

The best selected assortment of Patent Rights in the United States for sale by E. E. Roberts & Co., 15 Wall st., New York. See advertisement headed Patentees. Sales made on Commission.

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For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

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To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States Terms $4 00 a year.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HAME FASTENING.—Sinclair D. G. Niles, Helena, Ark.—This invention relates to a new fastening for hames, and has for its object to get rid of the hame strings now in use, which, being of leather and either tied or buckled, will soon wear out, besides being difficult to hold in place.

DEVICE FOR PROPELLING CANAL BOATS AND OTHER VESSELS.—Edward K. Watson, Shokan, N. Y.—This invention has for its object to furnish an improved device designed more particularly for attachment to canal boats, but which may be attached to other kinds of vessels, and which shall be simple in construction and effective in operation, preventing any injurious wash of the banks.

ORGAN TREMULANT.—T. P. Sanborn, Boston, Mass.—This invention relates to a new and useful improvement in a device for producing the tremulous sound of the pipes of the church organ, and consists in a cylinder and valve, with a vibrating rod with balls or weights thereon, and with a thumb screw for regulating the motion of the valve.

DEVICE FOR OPERATING HAND FANS.—William A. Ireland, New York city.—This invention has for its object to furnish an improved device for operating a hand fan, which shall be simple in construction and effective n operation, enabling the fan to be vibrated easily and conveniently.

SELF-WINDING COUNTER SPOOL.—W. J. Fox, Morrisania, N. Y.—This invention has for its object to furnish an improved counter spool for holding cord to be used for tying up packages and other uses, and which shall be so constructed that when the end of a ball of cord is attached to the spool the spool will revolve and wind the cord upon it.

PLOW BEAM.—J. W. Sursa, San Francisco, Cal.—This invention relates to a new and useful improvement in beams for plows, more especially designed for gang plows, but applicable to other kinds of plows, and consists in making the beam or beams of angle iron.

MOLDING SASH WEIGHTS.—Wm. Ferguson and James Anderson, New York city.—This invention relates to improvements in molding sash weights, and it consists in making the molds for the principal parts in sand, without partings, and arranging the molds so formed for the application of chills for making the holes in the ends for attaching the cords, and for smoothing the same to protect the cords.

MACHINE FOR UPSETTING WAGON TIRE AND OTHER PURPOSES.—Wm. Hunt, Oskaloosa, Iowa.—The object of this invention is to provide a machine for blacksmiths' use, by means of which wagon or carriage tires or iron bands or bars may be upset or made less in diameter or length, and by which iron may be punched and cut.

ELECTRIC GAS LIGHTING APPARATUS.—Charles N. Ealer, Opelousas, La.—The object of this invention is to construct an electric apparatus for lighting a suitable number of gas lights in succession, so that a number of machines may be used in connection.

SEED PLANTER AND GUANO DISTRIBUTOR.—E. Blacklidge, Abbeville, Ala.—This invention relates to a new seed and guano planter, of extremely simple construction, and which can be used to deposit at once two different substances, and is not apt to get out of order or become injured by ordinary wear.

FIRE GRATE AND TILE.—Joseph Hackett, Louisville, Ky.—This invention relates to certain improvements in the construction of basket grates made in sections to be readily taken apart and put together.

DEVICE FOR SECURING HUBS TO AXLES.—George E. Clow, Jeffersonville Ind.—This invention consists of an axle-box provided with a tube passing radially through one side of the box, and through the inclosing hub, in combination with a key, which, when placed in said tube, project into the axle-box; and with an axle provided with a transverse circumferential groove which the inner end of the key enters, thus connecting the axle and box; the tube being externally threaded in order that a cap may be screwed upon it, and serving also as an oil reservoir, the escape of oil from which is regulated by the key.

STREET CAR SIGNAL.—William Brown, Duncannon, Pa.—This invention has for its object to enable conductors to show inside street cars a label bearing the name of the street the car is running on, and at every corner a label bearing the name of the street about to be crossed, for the purpose of saving the conductor the trouble of making, and the passengers the difficulty often experienced of understanding, verbal announcements.

POTATO DIGGER.—S. E. Anthony, Stillwater, N. Y.—This invention has for its object to break up the hills in which potatoes lie during the period of their growth, and to separate the roots from such broken-up earth.

MUSIC STAND.—Lewis V. Brown, Salisbury, N. C.—This invention relates to a new and useful improvement in stands for holding sheet music, designed more especially for performers in brass bands, but convenient for all instrumental performers, singers, public readers, lecturers, etc., and it consists in an extension staff provided in the socket cap for a candle or lamp, and with adjustable arms with springs attached thereto for holding the sheet or sheets.

ADJUSTABLE AWNING.—L. Yenne, N. Y. city and C. Schneider, Newark, N. J.—This invention relates to a new flexible awning, so arranged that it can be extended or contracted at pleasure. The invention consists first in the construction of the swinging frame which holds the flexible cover with a ratchet and spring pawl, whereby the degree of extension can be nicely regulated.

DITCHING MACHINE.—Ralph Robert Osgood, Troy, N. Y.—This invention relates to a new ditching machine, which is provided with a rotary wheel that carries buckets at both sides by means of which the digging is done; the buckets are hung to the sides of the wheel in such manner that their outer, working ends will be in line with the edge of the wheel, so that they obtain the full power of the wheel.

BRIDGE.—Isaac H. Wheeler, Sciotoville, O.—This invention relates to improvements in trussed bridges, and consists in the employment, in connection with the upper and lower chords, of an intermediate chord and an arrangement with the truss braces and chords of short braces, calculated to impart greater strength than when only two chords and long braces are used, the said chords and braces being made single or double, or triple, as may be required by the case in hand, but usually the lower and middle chord is double and the upper one single. The invention also relates to the arrangement of the cord ties and lateral braces at the top, and in a diagonal arrangement of the floor and connection of the lower chord ties for lateral bracing in substitution of the lateral braces commonly used at the bottom.

FENCES.—Lester Philips, Eau Claire, Wis.—This invention relates to improvements in the construction of farm fences, and consists in certain details of construction, whereby a cheap, durable, portable fence is provided which is adapted for being set vertically on side hills or level ground, and made so that the parts may be all fitted in the shop for putting together in the field, in a simple manner, the like parts being interchangeable.

MACHINE FOR DRESSING TILE.—George Barney, Swanton, Vt., and V. G Barney, Minneapolis, Minn.—This invention relates to improvements in machines for squaring and facing floor tile, and consists in an arrangement of a squaring frame, above a horizontal, revolving dressing disk, and certain peculiar attachments thereto for holding the tile to be squared and dressed on the edges. Also, an improved arrangement of apparatus for holding the tile upon the disk for facing, and also improvements in sand and water-feeding apparatus.

OILER.—John Gates, Portland, Oregon.—This invention relates to improvements in oilers for steam cylinders, journal bearings, and the like, and consists in the arrangement of oilers for the employment of water, in connection with the vessel to contain the oil, under pressure, for forcing the oil from the vessel to the part to be lubricated, either in jets or in a slow, continuous feed, the water being admitted to the vessel to force the oil out the top.

CORN PLANTER.—William M. Meyers, New Brunswick, N. J.—This invention has for its object to furnish a simple, convenient, and effective corn planter, which shall be so constructed and arranged that it may be readily adjusted to drop more or less kernals at a time or to plant the rows at a greater or less distance apart, as may be desired.

CORN PLANTER.—Joseph Cosand, Russiaville, Ind.—This invention has for its object to furnish an improved corn planter, which shall be so constructed as to plant two rows at the same time, and in such a way as to be in complete check row without the land's being previously marked, and which shall, at the same time, be accurate and uniform in its operation.

MUD AND ORE MILLS.—John Kellet, Elizabethport, N. J.—This invention relates to that class of mud and ore crushing mills wherein the pan is caused to revolve under the vertically revolving crushers, and consists in an arrangement therewith of a shovel on a long sweep or lever, balanced at or near the center, on a crotched and horizontally revolving or oscillating support, so arranged relatively to the pan that the contents thereof may be shoveled out of the pan with safety and convenience when the mill is running.

SCREW PROPELLER.—J. D. Ford, Baltimore, Md.—This invention relates to improvements in screw propellers, and consists in an arrangement for changing and securing the blades of a propeller on apparatus worked within the vessel, so that they may be adjusted to and secured in the position for working, or the two sets of blades may be brought into the same axial plane, for moving through the water, when not revolving, so as to encounter less resistance from the water than when in the working position.

SMOKING PIPE.—Chas. F. Hitselberger, Libertytown, Md.—This invention relates to improvements in smoking pipes, and consists in a pipe provided with a nicotine cup attached to the bowl, a water vessel for cooling and purifying the smoke, on an intermediate tube leading from the bowl to the stem, and a saliva cup, attached to the lower end of the latter, all arranged in a way calculated to protect the smoker from the nicotine, heat, and other offensive tastes of the tobacco, and to prevent the stoppage of the smoke passage.

SAP FEEDER.—Geo. D. Chandler, West Concord, Vt.—This invention relates to improvements in automatic sap feeders, such as described in a patent dated Nov. 2, 1869, No. 96,392, and consists in an improved arrangement of the float lever by which the admission passage is opened and closed, for adjustment for varying hights of the sap in the boilers; also, in an arrangement for attaching the regulating apparatus to the side of the boiling kettle, and connecting it with the reservoir by a flexible pipe, the connection of the flexible pipe being such that it may be readily detached.

SAFETY VALVE.—W. R. Reece, Tremont, Pa.—This invention relates to improvements in safety valve apparatus for steam boilers, and consists in an arrangement of the valve lever in connection with a float inside of the boiler, so that when the water falls too low therein the weight of the float will cause the fastening for the short arm of the lever to be tripped, so that the valve will be raised, and let the steam escape, and thereby prevent the boilers from exploding.

WASHING MACHINE.—A. L. Van Norman, Clinton, Pa.—This invention relates to improvements in washing machines, and consists in a combination with a tub, having a corrugated concave bottom, and a vertical central dividing wall, which may be readily applied or removed, to make one or two compartments, of a pair of vibrating arms or pendulums, mounted in suitable bearings or pivots, at the top of the cover, and carrying, at the lower ends, roller frames which work back and forth above the bottom, moving n opposite directions, being connected to a double cranked shaft above the pivots.

CARRIAGE BRAKE.—H. B. S. Davis, Farmington, Ill.—This invention relates to improvements in brakes for carriages, wagons, and the like, and consists in an arrangement, in connection with a sliding brake-support, of the front axle, to slide back under the bolster, when the animals hold back, against the brake support, and press the brakes against the hind wheels, and to slide forward again and release the brakes when the animals pull ahead. It also consists in the employment of cam-shaped brake shoes, pivoted to the supports in a way calculated to increase their efficiency.

INDEX.—Stephen S. Nash, New York city.—This invention relates to a new and useful index for school and other uses, where it is desirable to keep a changeable record or index of the good or bad standing of scholars, and the the like. The invention consists in a number of blocks or tablets of wood, paper, or other substance, having the names of scholars marked on them, or it may be numbers or other characters, which tablets are laid, one upon another, or side by side, in a case, confining the ends by rails or bars, one of which is hinged so as to be readily turned away from the tablets to admit of taking them out and putting them in again, for changing the order of their arrangement.

BALANCED SLIDE VALVE.—Collier & Masterman, Sacramento, Cal.—This invention relates to improvements in balanced slide valves, and consists in the arrangement in a cylindrical or other case, attached to the top of the steam chest, and opening into it, of a cylinder suspended above so as to swing back and forth with the valve, having a piston, the rod of which is jointed to the valve, one side of the piston being exposed to the steam in the valve chest, and the other to the atmosphere, so that the downward pressure on the valve is counteracted by the upward pressure of the steam on the under side of the piston, which is intended to be of such area as to regulate the pressure of the valve upon its seat, as may be required.

MACHINE FOR SCOURING GRAIN.—J. N. Harshbarger, Bloomington, Wis.—This invention relates to improvements in machines for scouring grain, and consists in a hollow cylinder of sheet metal, or other substance, mounted vertically in a suitable frame, and provided with a roughened inner surface, and with curved hollow arms on the lower portion, which are also roughened on the inner surfaces, in which cylinder is another, with a roughened exterior, but of considerable lesser size, which cylinders are revolved in opposite directions, and the grain is passed through the outer one and subjected to the action of both, after which it is discharged through the aforesaid arms, into an air-tight space, from which the dust and other light matters, detached by the scouring surfaces and taken out by a fan, mounted on the said air-tight case.

SNOW PLOW.—R. C. Harris, Maple Green, New Brunswick.—This invention relates to a new snow plow which is to be secured in front of a locomotive or railroad train for the purpose of clearing the track from the snow. The invention consists in the general new arrangement of an elevating scoop, screw, and discharge wheel, or "fling," all combined to elevate and scatter the snow, and also in making the said screw vertically extensible or contractible for the purpose of adjusting the apparatus to snow of varying depth

FRUIT CAN FUNNEL.—L. P. Edwards, Hamlinton, Pa.—This invention relates to a new and useful improvement in funnels for delivering fruit into cans, in the process of canning fruit, whereby much labor and trouble is saved, having especial reference to the class of fruit cans which are sealed by screw covers, and it consists in a funnel constructed with a lower delivery section which screws on to the top of the can.

CULTIVATOR.—J. H. Hamilton, Stevenson, Ala.—This invention has for its object to furnish an improved cultivator which shall be simple in construction, strong, durable, and effective in operation, and which may be be easily adjusted for the plows to work farther apart or closer together as may be desired.

ADJUSTABLE ARM FOR WORKING SLIDE VALVES, ETC.—Hubbard Hendrickson, Red Bank, N. J.—This invention has for its object to provide an adjustible arm by means of which the stroke of a slide or other valve in a steam chest can be regulated at will, so that the steam can be used more or less expansively, as may be desired.

BALANCED ROCK VALVE.—J. C. King, New York city.—This invention relates to a new rock valve for pumps, steam chests, etc., and has for its object to so construct the same that it will be fully balanced.

MILK CANS.—J. C. Milligan, Brooklyn, N. Y.—This invention relates to improvements in the construction of milk cans, and consists in the arrangements having for their object to provide the strongest can with the least amount of metal and the simplest construction.

BEDSTEAD FASTENING.—W. H. Carter, Candor, N. Y.—This invention relates to a new device for connecting the side rails and posts of bed steads, and consists in the use of a metal bow secured to the rail, and of a perforated bar or plate on the post, the said bar having slots to receive the dovetail end of the bow, and rests for the supports of said ends.

SOLAR CAMERA.—Norman Bryan, Thomaston, Ga.—This invention relates to improvements in solar cameras, and consists in improvements in arrangements of apparatus for turning the reflectors by clock-work attached for the purpose; also in improved adjusting apparatus for varying the reflectors according to the sun's variations.

MUSIC LEAF TURNER.—J. W. Mellor, Philadelphia, Pa.—This invention relates to a new apparatus for holding the leaves of music on a piano or other musical instrument, and for turning the same by the action of a foo on a pedal.

VALVE GEAR FOR STEAM PUMPS, ENGINES, ETC.—J. C. King, New York city.—The object of this invention is to construct a link motion for operating the valves of steam pumps and engines which adjusts the same so rapidly that the water or steam will be suddenly reversed, so that the dead center is entirely overcome.

WIND WHEEL.—B. C. Terry, Keyport, N. J.—This invention relates to improvements in wind wheels, and consists in an improved arrangement of means for feathering the vanes or fans.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING Sept. 20, 1870.

Reported Officially for the Scientific American

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107,433.—POTATO DIGGER.—S. E. Anthony, Stillwater, N. Y. Antedated September 10, 1870.

107,434.—HYDRANT.—William Bailey, Troy, N. Y.

107,435.—MACHINE FOR DRESSING TILES.—George Barney, Swanton, Vt., and V. G. Barney, Minneapolis, Minn.

107,436.—SEED AND GUANO DISTRIBUTER.—Edward Blacklidge, Abbeville, Ala.

107,437.—SELF-LOCKING HINGE.—G. E. Boisselier, St. Louis, Mo.

107,438.—BOLT CUTTER.—James R. Brown, Cambridgeport, Mass.

107,439.—SEAT FOR ROW BOATS.—Walter Brown, Boston, Mass.

107,440.—STREET INDICATOR FOR CITY CARS.—Wm. Brown, Duncannon, Pa. Antedated September 14, 1870.

107,441.—SOLAR CAMERA.—Norman Bryan, Thomaston, Ga.

107,442.—TOY GUN.—Edward Buckman and Alexander Buckman, Brooklyn, N. Y. Antedated September 5, 1870.

107,443.—WASHING MACHINE.—E. L. Bullock, Hartford, Conn.

107,444.—HOISTING GRAPPLE.—John A. Burgess (assignor to himself and Joshua Standish), Plymouth, Mass.

107,445.—BROOM-CORN SEED STRIPPER.—G. E. Burt and E. A. Hildreth, Harvard, Mass.

107,446.—CLOTHES BASKET.—Leander Carman and A. C. Carman McCoy's Station, Ohio.

107,447.—REMOVING BURRS FROM WOOL.—Peter Casson, San Francisco, Cal.

107,448.—SAP FEEDER TO SUGAR EVAPORATORS.—George D. Chandler, West Concord, Vt. Antedated September 10, 1870.

107,449.—FRUIT JAR.—T. A. Clark and H. C. Mascroft, Worcester, Mass.

107,450.—SHAVING MUG.—Frank B. Clock, Boston, Mass.

107,451.—EARTH CLOSET.—Lewis G. Clock, Manchester, N. H.

107,452.—SECURING HUBS TO AXLES.—G. E. Clow, Jeffersonville, Ind.

107,453.—BALANCED SLIDE VALVE.—Orrin Collier and Wm. H. Masterman, Sacramento, Cal.

107,454.—KNITTING MACHINE.—F. M. Comstock, Cleveland, Ohio.

107,455.—FOLDING OR KNOCK-DOWN CHAIR.—J. K. Coolidge, and N. H. Hill, Cincinnati, Ohio.

107,456.—HORSE HOE.—Ira Copeland, North Bridgewater, Mass.

107,457.—CORN PLANTER.—Joseph Cosand, Russiaville, Ind.

107,458.—SOLDERING MACHINE.—E. T. Covell, Brooklyn, N.Y Antedated September 10, 1870.

107,459.—DEVICE FOR BALANCING FANNING-MILL SHOES.—William Crane, Millgrove, Ind.

107,460.—SIGNAL BOX FOR FIRE-ALARM TELEGRAPHS.—S. D. Cushman, New Lisbon, assignor to the Automatic Fire-Alarm Company, Leetona, Ohio.

107,461.—COMBINED HARROW AND ROLLER.—Frank A. Dann and James McKibben, Wellsville, Mo.

107,462.—CARRIAGE BRAKE.—H. B. S. Davis, Farmington, Me.

107,463.—EXTENSION TABLE AND SETTEE.—Martin Debzell Wabash, Ind.

107,464.—CHURN.—Levi Dederick, New York city.

107,465.—ELECTRIC GAS-LIGHTING APPARATUS.—C. N. Ealer Opelousas, La.

107,466.—MEAT CHOPPER.—J. A. Eberly (assignor to himself and Abraham Godshalk), Reamstown, Pa.

107,467.—SEED PLANTER.—C. R. Edwards, Bowling Green Ky.

107,468.—FOLDING SASH WEIGHT.—William Ferguson and James Anderson, New York city.

107,469.—IRONING BOARD.—Jacob Fischer, Pittsburgh, Pa.

107,470.—WASHING MACHINE.—Charles Ford and Frank C Garbutt, Mason, Ill.

107,471.—PROPELLER.—John D. Ford, Baltimore, Md.

107,472.—LOCOMOTIVE.—William A. Foster, Fitchburg, Mass.

107,473.—BUNG.—Vincent Fountain, Jr., West New Brighton N. Y.

107,474.—MECHANICAL HAND MOTOR.—Harvey Fowler Washington, D. C.

107,475.—MECHANICAL HAND MOTOR.—Harvey Fowler Washington, D. C.

107,476.—BOX STEREOSCOPE.—Thomas Fugate, Cincinnati, Ohio.

107,477.—COOKING APPARATUS.—John Gallagher, Cleveland Ohio.

107,478.—LUBRICATOR.—John Gates, Portland, Oregon.

107,479.—COMBINED DRESSING BUREAU AND BATH TUB.—Jane E. Gilman, Hartford, Conn.

107,480.—APPARATUS FOR DECORTICATING, SEPARATING AND DRYING GRAIN.—A. J. Glas, London, England. Patented in England, December 17, 1869.

107,481.—PLOW.—Charles M. Gordon, La Porte, Ind.

107,482.—SHIELD FOR CARRIAGE STEP.—Chas. H. Gould (assignor to himself and William Lumb), Boston, Mass.

107,483.—Fireplace Grate.—Joseph Hackett, Louisville, Ky.
107,484.—Cultivator.—J. H. Hamilton, Stevenson, Ala.
107,485.—Snow Plow.—R. C. Harris, Maple Green, New Brunswick.
107,486.—Grain Scourer.—I. N. Harshbarger, Bloomington, Wis.
107,487.—Harvester.—Andrew J. Haswell and J. W. Irwin, Circleville, Ohio. Antedated Sepembper 12, 1870.
107,488.—Washing Machine.—Peter Hayden, Pittsburgh, Pa.
107,489.—Composition for Pavement.—J. R. Hayes, New York city.
107,490.—Preparation of Composition for Pavement.—J. R. Hayes, New York city.
107,491.—Shoemakers' Edge Plane.—A. P. Hazard, North Bridgewater, Mass.
107,492.—Adjustable Arms for Working Slide Valves.—Hubbard Hendrickson, Red Bank, N. J.
107,493.—Stand for Cleaning Window.—Edward Herdster, Chicago, Ill.
107,494.—Extension Lounge.—Nathan H. Hill, Cincinnati, Ohio.
107,495.—Smoking Pipe.—Charles F. Hitselberger, Libertytown, Md.
107,496.—Kiln for Burning Tiles, Pipes, etc.—John Hornsby, Woodbridge, N. J.
107,497.—Wagon Hub. — Jerome B. Hubbell, Naugatuck, Conn.
107,498.—Sash Holder.—H. C. Hunt, Amboy, Ill.
107,499.—Life-preserving Mattress.—Joshua Hunt, Providence, R. I.
107,500.—Compound Machine for Upsetting, Punching, and Cutting Metal.—Wm. Hunt, Oskaloosa, Iowa.
107,501.—Device for Operating Hand Fan.—W. A. Ireland, New York city.
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107,504.—Valve Gear for Steam Pump, Engine, etc.—J. C. King (assignor to himself, G. M. Woodward, and G. A. Blood), New York city.
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107,506.—Harrow Teeth.—Henry R. Kinney, Portsmouth, Ohio.
107,507.—Caster.—Joseph Kintz (assignor to himself and P. J. Clark), West Meriden, Conn.
107,508.—Corn Planter.—M. L. Kissell and J. B. Kissell, Springfield, Ohio.
107,509.—Bedstead and Cot.—H. W. Ladd, Chelsea, Mass. Antedated Sept. 8, 1870.
107,510.—Thrashing Machine Separator. — Isaac Lebo, Winterville, Pa.
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107,554.—Shovel for Seeder.—David Slaughter, Mountville, Pa. Antedated Sept. 12, 1870.
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107,565.—Rasp.—Ira F. Thompson, Providence, R. I.
107,566.—Center Plate for Stove Top.—John Thornley, Fallston, Pa.
107,567.—Ratchet Feed Mechanism.—Andrew Turnbull, New Britain, Conn.
107,568.—Wood Bucket.—Samuel S. Vail, Keokuk, Iowa. Antedated Sept. 12, 1870.
107,569.—Washing Machine.—A. L. Van Norman, Clinton, La.
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107,573.—Propelling Canal Boat.—E. K. Watson, Shokan, N.Y.
107,574.—Card Rack.—W. Wendell, Milwaukee, Wis. Antedated Sept. 17, 1870.
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107,622.—Hoop Shaving Machine.—Stillman Parker, Altoona, Pa.
107,623.—Apparatus for Coupling Cars.—R. F. Randolph, Jr., East Palestine, Ohio.
107,624.—Water Wheel Case.—James Raney, Newcastle, Pa.
107,625.—Machinery for Dressing Skins.—H. P. Reed and T. E. Wilson, Peabody, Mass.
107,626.—Electro-Magnetic Apparatus for Medical Use.—Charles Reitz, Indianapolis, Ind.
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107,628.—Bee Hive.—H. F. Rohm, West Providence, Pa.
107,629.—Base-Burning Cooking Stone.—T. P. Rossiter, Cold Spring, N. Y.
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107,635.—Rotary Air Wheel for Gas Carbureters.—J. F. Spence, Brooklyn, N. Y., and L. D. Towsley, Newark, N. J.
107,636.—Slide for Extension Tables.—Stephen Stilwell, Waterloo, N. Y.
107,637.—Method of Setting Posts.—U. B. Stribling, Madison, Ind.
107,638.—Gate.—J. J. Tofflemire and J. D. Linnell, Rockford, Ill.
107,639.—Rotary Power Plow.—James Tranter, Joseph Kinsey, and J. M. Carr, Cincinnati, Ohio.
107,640.—Grinding Mill.—Amos Verbeck, Sterling, Ill.
107,641.—Rounding-up Machine for Shoes.—H. S. Vrooman, Boston, Mass.
107,642.—Fabric for the Manufacture of Shoes, etc.—Enoch Waite, Franklin, Mass.
107,643.—Railway.—C. H. White, Emmett Township, Mich.
107,644.—Machine for Hulling and Scouring Grain, Rice, Coffee, etc.—L. H. Whitney, Washington, D. C.
107,645.—Rectifying and Improving Alcoholic Spirits. Daniel Worthen, Brooklyn, N. Y.

REISSUES.

4,124.—Division A.—Harvester.—Rufus Dutton, Yonkers, N. Y.—Patent No. 31,378, dated February 12, 1861.
4,125.—Division B.—Harvester.—Rufus Dutton, Yonkers, N. Y.—Patent No. 31,378, dated February 12, 1861.
4,126.—Reversible Knob Latch.—H. H. Elwell, South Norwalk, assignor, through mesne assignments, to the Russell and Erwin Manufacturing Company, New Britain, Conn.—Patent No. 53,536, dated March 27, 1866.
4,127.—Polishing Machine.—P. F. Randolph, Jerseyville, Ill.—Patent No. 95,365, dated September 28, 1869.
4,128.—Horse Hay Rake.—J. H. Shireman, York, Pa, assignee of G. S. Reynolds.—Patent No. 23,943, dated May 10, 1859.

DESIGNS.

4,357.—Box for Top of Bureaus.—Cheney Kilburn (assignor to Kilburn & Gates) Philadelphia, Pa.
4,358.—Shawl Fabric.—Martin Landenberger, Philadelphia, Pa.
4,359.—Berry Box.—J. W. Leslie, South Pass, Ill.
4,360.—Stove Plate.—N. S. Vedder, Troy, and T. S. Heister, Lansingburg, N. Y., assignors to N. S. Vedder.

EXTENSIONS.

Improved Buckle for Wearing Apparel.—Edward Parker, of Plymouth, Conn.—Letters Patent No. 15,666, dated September 2, 1856.

Reducing Wood Fibers to Paper Pulp.—Henry Voelter, of Heidenhein, Kingdom of Wurtemburg, Germany.—Letters Patent No. 21,161, dated August 10, 1858; antedated August 29, 1856: reissue No. 3,361, dated April 6, 1869.

Saw Gummer.—R. H. Garrigues, of Salem, Ohio, administrator of L. A. Dole, deceased. Letters Patent No. 15,718, dated September 9, 1856.

Repairing Railway Bars.—George Johnson, of Marshall, Mich, administrator of J. D. Cawood, deceased.—Letters Patent No 15,687, dated September 9, 1856.

Machinery for Combing Wool.—M. H. Simpson, of Boston, Mass.—Letters Patent No. 16,864, dated March 17, 1857; antedated September 17, 1856.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,303.—Manufacture of Superphosphate of Lime.—C. Morfitt, Baltimore, Md. August 20, 1870.

2,323.—Knitting Machine.—W. H. Abel, Lowell, Mass. August 23, 1870.

1,366.—Apparatus for Removing Snow from Lines of Railways.—J. W. Elliot, Ontario, Canada. May 13, 1870.

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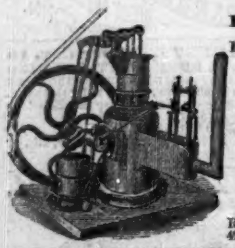

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